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U. S. DEPARTMENT OF COMMERCE
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MINERAL RESOURCES
OF THE
UNITED STATES
1927

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PART II—NONMETALS

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MINERAL RESOURCES OF THE UNITED STATES, 1927—PART II

FUEL BRIQUETS

By F. G. Tryon and J. M. Corse

PRODUCTION

The production of fuel briquets in 1927 was 970,468 net tons[1] valued at $7,985,165, according to reports courteously furnished by the operators of briquetting plants. In comparison with 1926, the production showed a decrease of 24,864 tons, but in comparison with 1925, an increase of 131,098, and with 1924, an increase of 389,998. As demand in 1926 had been artificially stimulated by the anthracite strike, a decrease in 1927 was anticipated. That the sales of briquets declined only 2.5 per cent below the level of the strike year at a time when anthracite was in abundant supply is an indication of the progress of the briquetting industry. In fact, production in the month of December, 1927, which amounted to 148,830 tons, set a new monthly record, exceeding by 8,175 tons the maximum monthly production of 1926.

As shown by the following table, the decrease from 1926 was confined to the Eastern States; on the Pacific coast and in the Central States production in 1927 showed an increase of about 9 per cent.

Fuel briquets produced in the United States, 1926–27

	Production			Value		
	1926	1927	Increase or decrease	1926	1927	Increase or decrease
	Net tons	*Net tons*	*Per cent*			*Per cent*
Eastern States	288, 884	196, 726	−31. 9	$2, 110, 932	$1, 293, 918	−38. 7
Central States	575, 130	630, 066	+9. 6	5, 093, 062	5, 232, 013	+2. 7
Pacific Coast States	131, 318	143, 676	+9. 4	1, 329, 185	1, 459, 234	+9. 8
	995, 332	970, 468	−2. 5	8, 533, 179	7, 985, 165	−6. 4

In the 20 years from 1907, the date of the first statistical survey of the industry, to 1927 the production of briquets has increased nearly fifteenfold. As the following table shows, the production grew steadily up to 1911 and then for a time showed no consistent advance. The scarcity of fresh-mined anthracite from late 1916 to 1918 gave the infant industry its start, and within three years the production virtually doubled. Subsequent expansion was undoubtedly stimulated by the anthracite shortages of 1920, 1922–23, and 1925–26, but these periodic crises in the supply of anthracite have merely served to accelerate what would otherwise have been a fairly steady increase in the demand for briquets. In 1927, when all trace of the shortage caused by the anthracite strike of 1925–26 had disappeared, the sales of briquets were 67 per cent greater than in 1924.

A feature of the development of the industry in the last decade has been the rapid growth of production in the Central States, where high transportation costs on anthracite stimulate the demand for other fuels suitable for domestic use. From 1917 to 1927 the production of the Central States increased 475,000 tons, or 306 per cent, while the production of all other States increased only 35 per cent. Particularly rapid has been the growth of the industry in Wisconsin, which now produces well over half of the total output.

Fuel briquets produced in the United States, 1907–1927 [1]

Year	Net tons	Value
1907	66, 524	$258, 426
1908	90, 358	323, 057
1909	139, 661	452, 697
1910	(2)	(2)
1911	218, 443	808, 721
1912	220, 064	952, 261
1913	181, 859	1, 007, 327
1914	250, 635	1, 154, 678
1915	221, 537	1, 035, 716
1916	295, 155	1, 445, 662
1917	406, 856	2, 233, 888
1918	477, 235	$3, 212, 793
1919	295, 734	2, 301, 054
1920	567, 192	4, 623, 831
1921	398, 949	3, 632, 301
1922	619, 425	5, 444, 926
1923	696, 810	5, 898, 698
1924	580, 470	4, 986, 622
1925	839, 370	7, 128, 404
1926	995, 332	8, 533, 179
1927	970, 468	7, 985, 165

[1] Figures for earlier years not available.

(2) No canvass for 1910.

The seasonal character of househeating makes the production of briquets also highly seasonal. Many plants shut down in the spring and early summer, and those continuing to operate report decreased output at that time. As production must necessarily precede consumption by a period long enough to permit distribution to the consumer, the period of greatest activity at the plants is in late autumn and early winter, and by January production normally begins to decline. In 1927 the minimum was reached in April, when only 28,067 tons were produced—hardly a fifth of the maximum of 148,830 tons in December. In May and June only 7 of the 19 plants were in operation.

Monthly production of fuel briquets in the United States, 1924–1927, in net tons

Month	1924	1925	1926	1927
January	80, 938	93, 310	125, 721	123, 239
February	42, 609	62, 479	110, 815	79, 227
March	24, 953	47, 504	66, 811	37, 557
April	20, 183	26, 498	35, 281	28, 067
May	17, 795	26, 350	31, 943	42, 243
June	16, 017	28, 183	32, 870	52, 927
July	25, 611	42, 224	40, 877	28, 692
August	40, 743	63, 161	57, 603	72, 577
September	65, 745	79, 118	80, 066	99, 261
October	74, 873	118, 543	134, 543	131, 699
November	80, 936	123, 316	140, 655	126, 149
December	90, 067	128, 684	138, 147	148, 830
	580, 470	839, 370	995, 332	970, 468

VALUE

The total value of the product in 1927, f. o. b. plant, was $7,985,165, a decrease of $548,014, or 6.4 per cent, when compared with 1926.

The average amount received by producers on all the briquets sold in 1927 was $8.23 a ton. This figure is of doubtful significance, however, because of the varying conditions under which briquets are manufactured in different parts of the country. Among the factors influencing the value per ton at any plant, the most important are probably the cost of raw materials and the prices of competing fuels.

The trend of prices from year to year is best indicated by the average value in particular localities, as shown by the following table. The average value f. o. b. producer's plant for the State of Pennsylvania in 1927 was $6.52, a decrease of 22 cents from 1926 but an increase of 70 cents over 1924. The average value of the product of the Central States—most of which comes from two plants at the head of Lake Superior—was $8.30 a ton, compared with $8.86 in 1926 and $9 in 1924.

Average value per net ton (f. o. b. plant) of briquets produced in Pennsylvania and in the Central States, 1911–1927

Year	Pennsylvania	Central States
1911	$2.37	$4.34
1912	2.68	4.47
1913	2.65	4.92
1914	2.48	4.83
1915	2.90	4.26
1916	3.83	4.73
1917	3.15	6.81
1918	4.11	8.17
1919	4.17	8.47
1920	$5.60	$9.23
1921	6.14	9.28
1922	5.93	9.02
1923	5.95	9.35
1924	5.82	9.00
1925	6.35	8.72
1926	6.74	8.86
1927	6.52	8.30

NUMBER OF PLANTS IN OPERATION

Nineteen plants reported production of briquets on a commercial scale in 1927, the same number as in 1926. It is interesting to note that there were only eight more plants operating in 1927 than in 1907, the year of the first survey, but that the average plant output has increased in the same period from 6,048 to 51,077 tons. The development of the industry has been marked by the erection of many small plants that have later been dismantled and by the expansion of undertakings that have proved commercially successful. The records of the bureau disclose a total of 43 plants that have gone out of business during the last 20 years. In the same period other plants have firmly established themselves and built up a permanent business.

Number and average production of briquet plants in operation in the United States, 1907–1927

Year	Plants in operation	Average production per plant (net tons)
1907	11	6,048
1908	8	11,295
1909	16	8,729
1910	(1)	(1)
1911	21	10,402
1912	19	11,582
1913	17	10,698
1914	16	15,665
1915	15	14,769
1916	15	19,677
1917	13	31,297
1918	12	39,770
1919	12	24,645
1920	15	37,813
1921	15	26,597
1922	14	44,245
1923	14	49,772
1924	12	48,373
1925	17	49,375
1926	19	52,386
1927	19	51,077

[1] No canvass for 1910.

MEN EMPLOYED AND OUTPUT PER MAN

The number of men (excluding delivery men and office workers) employed in briquetting plants in 1927 during the busy season was 426, of whom 205 were in the Eastern States, 141 in the Central States, and 80 in the Pacific Coast States. The largest number employed in any one plant was 61. Three plants employed more than 50 men, and two plants less than 5 men.

The average output per man at all plants in 1927 was 2,278 tons, but at individual plants it varied within wide limits. The three largest plants, employing 50 men or more, reported an average output of 4,309 tons per man, as contrasted with less than 1,000 tons per man at most of the smaller plants.

Classification of briquet plants, by number of men (excluding delivery men and office force) employed during busy season in 1927

Men per plant	Number of plants	Total number of men	Average production per man per year (net tons)
Less than 5 men	2	8	877
5 and less than 10	3	27	736
10 and less than 15	4	52	422
15 and less than 20	4	64	1,128
20 and less than 50	3	101	987
50 men and over	3	174	4,309
	19	426	2,278

HOURS OPERATED PER DAY

Working more than one shift a day offers obvious advantages in reducing overhead charges per ton, and most of the plants active in 1927 reported that they worked two or three shifts a day during the busy season. Ten plants, producing 86 per cent of the total output, operated 21 hours or more per day, and two plants operated from 16 to 18 hours. The seven plants working from 8 to 10½ hours a day contributed only 6 per cent of the total output.

Classification of briquet plants, by number of hours operated per day during busy season in 1927

Hours per day	Number of plants	Production (net tons)
21 to 24 hours	10	832,253
16 to 18 hours	2	79,803
8 to 10½ hours	7	58,412
	19	970,468

CAPACITY OF PLANTS

The following table shows the hourly capacity of the plants operated in 1927. The smallest plant had a capacity of 1 ton per hour and the two largest a capacity exceeding 75 tons. When operating three shifts a day, as is the practice in the busy season, each of the two largest plants has a capacity of well over 1,800 tons every 24 hours.

Classification of briquet plants, by hourly capacity in 1927

Capacity per hour	Number of plants
Less than 5 net tons	3
5 and less than 10	3
10 and less than 25	6
25 and less than 50	5
50 and less than 75	-----
75 net tons and over	2
	19

A further conception of the prevailing size of the briquetting works may be obtained by grouping them according to their total production. The table that follows shows that in 1927 three plants produced less than 2,000 tons each, that the greatest number produced between 5,000 and 10,000 tons, and that there were two plants which produced more than 200,000 tons.

Classification of briquet plants, by size of output in 1927

Output	Number of plants
Less than 2,000 net tons	3
2,000 and less than 5,000	3
5,000 and less than 10,000	6
10,000 and less than 25,000	1
25,000 and less than 50,000	1
50,000 and less than 100,000	2
100,000 and less than 200,000	1
200,000 net tons and over	2
	19

RAW FUELS

A total of 950,808 tons of raw fuel of all kinds was briquetted in 1927. In the following table this total is segregated by kinds in as great detail as is possible without disclosing the operations of individual plants. The table shows that there has been a marked increase of late years in the proportion of fuels other than anthracite. The quantity of semibituminous and bituminous slack used (including small amounts of semicoke in 1927) increased from 225,508 tons, or 33 per cent of the total, in 1923 to 502,686 tons, or 53 per cent, in 1927. The anthracite and semianthracite used in 1927 constituted 38 per cent of the total, and the remaining 9 per cent was subbituminous coal and carbon residue from the manufacture of oil gas.

Raw fuels used in making briquets in the United States, 1923–1927, in net tons

Fuel	1923	1924	1925	1926	1927
Anthracite culm and fine sizes and semianthracite	331,102	224,539	387,454	426,064	359,438
Semibituminous and bituminous slack and semicoke [1]	225,508	297,814	341,161	456,546	502,686
Subbituminous coal and oil-gas residue	125,880	[2] 61,012	115,975	88,525	88,684
	682,490	583,365	844,590	971,135	950,808

[1] Includes no semicoke, 1923–24.

[2] Includes no subbituminous coal.

In Europe much of the bituminous coal and anthracite used in briquet manufacture is washed in order to reduce the per cent of ash in the finished briquet. In the United States much of the Pennsylvania anthracite used in briquets is washed either by the colliery operator or the briquet manufacturer. Other raw fuels in the United States are seldom washed.

The character of raw fuel used by the 19 plants operating in 1927 was as follows:

Classification of briquet plants, by kinds of raw fuel used in 1927

Kind of raw fuel used	Number of plants
Anthracite fines	5
Semianthracite fines	2
Mixture of anthracite fines and bituminous slack	4
Bituminous or subbituminous slack	2
Semibituminous fines	1
Semicoke (low-temperature coke or char)	2
Carbon residue from the manufacture of oil gas	3
	19

BINDERS

Asphaltic pitch continues to be the binder most often used in the manufacture of briquets and was employed either alone or in combination by 12 out of the 19 plants active in 1927. Nine producers used asphaltic pitch exclusively, two asphaltic pitch and coal-tar pitch, one a mixture of asphaltic pitch and starch, two coal-tar pitch derived from low-temperature carbonization, one sulphite liquor, and one a mixture of sulphite liquor and molasses residue. Three plants briquetting the carbon residue from oil gas required no binder.

Four of the 16 plants using a binder reported that they recarbonized the briquets after coming from the presses in order to drive off smoke from the binder.

The percentage of binder to raw fuel, by weight, ranged from less than 5 to 9 per cent or more. The proportion most commonly used was 5 or 6 per cent.

Classification of briquet plants, by percentage of binder used in 1927

Binder used	Number of plants
Using no binder (carbon residue)	3
Using—	
Less than 5 per cent binder	1
5 and less than 7 per cent	7
7 and less than 9 per cent	5
9 per cent and over	3
	19

PLANTS OPERATED IN 1927

A list of the 19 plants active in 1927 follows. Three plants active in 1926 produced no briquets for sale in 1927, but three new plants began operation during the year—the Salem Briquette Co., at Salem, Mass., the West Virginia Super Fuel Co., at Moundsville, W. Va., and the Philadelphia & Reading Coal & Iron Co.'s new plant in North Manheim Township, Pa.

Briquetting plants operated in the United States in 1927

State	Name and address of operator	Location of plant	Date put in operation	Raw fuel used
Eastern States:				
Maryland	Anthracite Fuel Corporation, Eighth St. and Fait Ave., Baltimore, Md.	Baltimore	1925	Anthracite and bituminous slack.
Massachusetts.	Salem Briquette Co., Salem, Mass	Salem	1927	Anthracite
New Jersey	Anthracite Manufacturing Co., 520 Brunswick Ave., Trenton, N. J.	Trenton	1918	Do.
Do	Navicoal Corporation, 437 Chestnut St., Philadelphia, Pa.	Perth Amboy	1925	Anthracite and bituminous slack.
Pennsylvania	American Briquet Co., 1505 Franklin Bank Building, Philadelphia, Pa.	Lykens	1920	Anthracite.
Do	Anthracite Briquette Co., Sunbury, Pa.	Sunbury	1919	Do.
Do	Philadelphia & Reading Coal & Iron Co., Twelfth and Market Sts., Philadelphia, Pa.	North Manheim Township.	1927	Do.
Virginia	Delparen Anthracite Briquette Co., Parrott, Va.	Parrott	1915	Virginia semianthracite.
Do	Virginia Fuel Corporation, P. O. Box 505, Norfolk, Va.	Portsmouth	1923	Anthracite and bituminous slack.
West Virginia	Consolidation Coal Products Co., 24 Broad St., New York, N. Y.	Fairmont	1925	Semicoke.[1]
Do	West Virginia Super Fuel Co., 712 Park Building, Pittsburgh, Pa.	Moundsville	1927	Do.
Central States:				
Missouri	Standard Briquet Fuel Co., 818 Security Building, St. Louis, Mo.	Kansas City	1909	Arkansas semianthracite.
Wisconsin	Berwind Fuel Co., 122 S. Michigan Ave., Chicago, Ill.	Superior	1912	Semibituminous slack.
Do	Stott Briquet Co., Merchants National Bank Building, St. Paul, Minn.	do	1909	Anthracite fines and bituminous slack.
Pacific Coast States:				
California	San Diego Gas & Electric Corporation, 861 Sixth St., San Diego, Calif.	San Diego	1925	Carbon (petroleum residue).
Do	Los Angeles Gas & Electric Corporation, 810 S. Flower St., Los Angeles, Calif.	Los Angeles	1905	Do.
Oregon	Portland Gas & Coke Co., Public Service Building, Portland, Oreg.	Portland	1913	Do.
Washington	Pacific Coast Coal Co., 612 L. C. Smith Building, Seattle, Wash.	Renton	1914	Coking bituminous slack and free-burning slack.
Do	Wilkeson Coal & Coke Co., Wilkeson, Wash.	Fairfax	1926	Bituminous slack.

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[1] The residue of low-temperature carbonization of bituminous coal.

FOREIGN TRADE IN BRIQUETS

Until recently the quantity of briquets imported was negligible; the anthracite shortages of 1922–23 and 1925–26, however, served to introduce the European product to householders in New England, and importations continued on a considerable scale during 1927. As late as 1921 the imports amounted to only 66 tons. In the winter of 1922–23 they rose to about 55,000 tons, only to fall to 38 tons in 1924. The anthracite strike of 1925-26 led to the importation of 6,758 tons of briquets in 1925 and of 123,593 tons in 1926. In 1927 importations persisted, although on a smaller scale, and a total of 60,601 tons was reported.

Most of the 1927 imports were "Westphalian ovoids," made from washed anthracite fines in the Ruhr district of Germany, and were discharged at Boston, Mass., and at Providence, R. I. According to the customs records, 57,743 tons of the imports in 1927 came from Germany (and the Netherlands), 2,749 tons from the United Kingdom, and 109 tons from France. A total of 55,043 tons came in at

Boston, 5,412 tons at Providence, 145 tons at New York, and 1 ton at San Francisco.

Briquets and other composition coals for fuels imported for consumption in the United States, 1919–1927 [1]

Year	Net tons	Value
1919	136	$1,050
1920	(2)	9
1921	66	251
1922	34,862	139,382
1923	19,559	103,201
1924	38	$443
1925	6,758	43,931
1926	123,593	736,804
1927	60,601	314,435

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[1] Compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

[2] 112 pounds.

WORLD PRODUCTION

The world's production of briquetted fuel is now about 50,000,000 metric tons a year, four-fifths of which is contributed by Germany. The following table presents the statistics available on production in foreign countries from 1923 to 1927:

World production of fuel briquets, 1923–1927, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
Algeria	31,234	79,265	74,495	57,442	(1)
Belgium	1,929,260	2,030,310	2,237,171	2,142,660	1,714,000
Canada	36,626	----------	----------	----------	----------
Czechoslovakia:					
Coal	99,631	75,710	156,477	181,797	160,255
Lignite	196,205	175,613	211,884	197,211	211,767
France	5,051,089	5,427,105	5,781,000	4,086,370	3,905,806
Germany: [2]					
Coal	1,941,535	4,359,476	5,590,613	5,901,593	4,971,163
Lignite	26,854,083	29,399,746	33,663,447	34,358,043	36,462,782
Great Britain	1,167,532	1,208,610	1,243,090	850,774	(1)
Hungary	45,251	27,535	32,412	58,854	42,553
Indo-China	46,426	76,211	89,820	97,456	(1)
Netherlands	473,579	562,181	570,717	675,405	(1)
Netherland East Indies	12,387	28,373	22,644	96,159	(1)
Poland	309,467	444,231	375,100	239,160	252,776
Spain	663,667	627,014	670,974	686,707	545,724
United States	632,132	526,591	761,460	902,945	880,389
Venezuela	3,611	3,475	2,043	(3)	(1)
	39,493,715	45,051,446	51,483,347	50,535,000	(1)

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[1] Data not available.

[2] Exclusive of the Saar district under the control of France.

[3] Estimate included in total.

FLUORSPAR AND CRYOLITE

By HUBERT W. DAVIS

FLUORSPAR

Fluorspar, or fluorite, is a nonmetallic crystalline mineral that usually occurs in glassy, transparent isometric crystals, largely cubic, or in cleavable masses. Less commonly it has a granular or fibrous structure, and occasionally it is banded. Fluorspar has a specific gravity of 3.2, is brittle, has a hardness of 4, and can easily be scratched with a knife. Fluorspar is a mineral of many colors, ranging from clear, colorless, or slightly bluish, and glasslike, through various striking hues, of which purple and green are most common; much of it is white and opaque. Chemically it consists of calcium and fluorine in the proportion of 51.1 to 48.9.

Salient features of the fluorspar industry in 1927 are the decrease in domestic shipments; the pronounced increase in the imports from Germany and the equally pronounced decrease in the imports from the United Kingdom; the large stocks of fluorspar at consumers' plants on December 31, 1927, especially the stocks of 85,000 short tons that have been accumulated at basic open-hearth steel plants; and the increase in producers' stock piles, which are also the largest ever accumulated.

PRODUCTION AND SHIPMENTS

Shipments of fluorspar to steel plants by domestic producers in 1927 were 12 per cent less than in 1926; there were also decreases of 27 and 21 per cent, respectively, in the shipments of fluorspar for use in foundries and glass plants. The exports of fluorspar in 1927 were the smallest since 1921. Shipments of fluorspar to manufacturers of enamel and of hydrofluoric acid exceeded those of 1926 by 12 and 10 per cent, respectively. Shipments of fluorspar, amounting to 685 short tons, for use in the manufacture of Portland cement were recorded in 1927; these shipments, though small compared to shipments for other uses, represent a substantial increase over the corresponding shipments in 1926.

In 1927 shipments of fluorspar from domestic mines aggregated 112,546 short tons, valued at $2,034,728, or a decrease of 13 per cent in both quantity and total value, as compared with 1926. The general average value per ton f. o. b. mines or shipping points for all grades in 1927 was $18.08, which is 12 cents lower than the average in 1926. The general average value of the fluorspar shipped to steel plants in 1927 from the Illinois-Kentucky district was $16.59 a ton and from the Colorado-New Mexico district was $13.72 a ton. This difference in average values represents chiefly economic factors in marketing rather than differences in quality of fluorspar from these two districts.

The table that follows presents such details of the shipments of fluorspar for 1924 to 1927, by States, as may be published without revealing the statistics of individual producers except by permission.

Fluorspar shipped from mines in the United States, 1924–1927

State	Gravel			Lump			Ground			Total		
	Short tons	Value		Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average		Total	Average		Total	Average		Total	Average
1924												
Colorado	11,986	$130,791	$10.91	315	$4,620	$14.67				12,301	$135,411	$11.01
Illinois	54,541	1,042,089	19.11	2,766	108,090	22.68	4,760	$356,871	$35.89	62,067	1,288,310	20.76
Kentucky	41,809	789,352	18.88	932			5,106			47,847	988,940	20.67
New Mexico	1,620	19,318	11.92	883			77			2,580	35,178	13.63
Utah				184						184	3,292	17.89
	109,956	1,981,550	18.02	5,080	112,710	22.19	9,943	356,871	35.89	124,979	2,451,131	19.61
1925												
Colorado	10,560	137,343	13.01	1,216	16,364	13.46				11,776	153,707	13.05
Illinois	46,195	783,451	16.96	3,366	115,814	21.13	4,867	308,881	32.25	54,428	1,024,516	18.82
Kentucky	39,153	669,672	17.10	1,176			4,497			44,826	833,794	18.60
New Mexico	1,487	20,817	14.00	939			213			2,639	40,325	15.28
	97,395	1,611,283	16.54	6,697	132,178	19.74	9,577	308,881	32.25	113,669	2,052,342	18.06
1926												
Illinois	47,254	812,129	17.19	1,780	108,710	20.54	4.700	363,713	32.26	53,734	1,012,879	18.85
Kentucky	53,386	912,525	17.09	2,641			6,467			62,494	1,167,129	18.68
New Mexico	1,063	144,200	12.59	820			106			1,989	161,269	12.98
Colorado	10,389			51						10,440		
	112,092	1,868,854	16.67	5,292	108,710	20.54	11,273	363,713	32.26	128,657	2,341,277	18.20
1927												
Illinois	38,970	656,863	16.86	2,471	105,062	21.18	4,565	330,356	31.31	46,006	863,909	18.78
Kentucky	50,533	839,933	16.62	1,454			5,508			57,495	1,040,338	18.09
New Mexico	1,562	102,514	13.61	574			477			2,613	130,481	14.43
Colorado	5,971			461						6,432		
	97,036	1,599,310	16.48	4,960	105,062	21.18	10,550	330,356	31.31	112,546	2,034,728	18.08

HISTORY OF PRODUCTION

The accompanying table presents statistics of the production of fluorspar in different States beginning with 1880. The record of production prior to 1880 was not obtained, and the statistics for Kentucky and Colorado are incomplete for certain years after 1880, so that more fluorspar has been mined than the table shows. The unrecorded output must be small, however, as the advantages of fluorspar over limestone as a flux in basic open-hearth steel plants have been generally recognized only since about 1899. Before that time fluorspar was used mainly in the preparation of hydrofluoric acid and in the manufacture of opalescent glass; consequently the demand was small.

The production of fluorspar by years for 1880 to 1904, a brief discussion of the history of mining in the different States, and estimates of unrecorded output in early years are given in Mineral Resources, 1925, part 2, pages 9 to 14.

Fluorspar produced[1] *in the United States, 1880–1927, by States*

Year	Arizona		Colorado		Illinois		Kentucky		Nevada		New Hampshire		New Mexico		Tennessee		Utah		Washington		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1880–1904	654	$6,593	------	----------	169,870	$1,037,399	134,186	$740,467	------	------	------	------	------	------	400	$3,400	------	------	------	------	305,110	$1,787,859
1905	------	------	1,156	$8,200	33,275	220,206	22,694	132,362	------	------	------	------	------	------	260	1,720	------	------	------	------	57,385	362,488
1906	------	------	300	1,800	28,268	160,623	11,868	79,802	------	------	------	------	------	------	360	1,800	------	------	------	------	40,796	244,025
1907	------	------	3,300	11,400	25,128	141,971	21,058	133,971	------	------	------	------	------	------	------	------	------	------	------	------	49,486	287,342
1908	34	252	701	4,266	31,727	172,838	6,323	48,642	------	------	------	------	------	------	------	------	------	------	------	------	38,785	225,998
1909	30	435	350	2,100	41,852	232,251	7,800	53,233	------	------	------	------	710	$3,728	------	------	------	------	------	------	50,742	291,747
1910	------	------	268	1,608	47,302	277,764	17,003	124,574	------	------	------	------	4,854	26,250	------	------	------	------	------	------	69,427	430,196
1911	------	------	721	4,226	68,817	481,635	12,403	96,574	------	------	800	$6,400	4,307	22,612	------	------	------	------	------	------	87,048	611,447
1912	------	------	1,639	9,834	103,937	695,467	10,473	61,186	------	------	300	1,500	196	1,176	------	------	------	------	------	------	116,545	769,163
1913	100	800	4,432	26,592	85,854	550,815	19,622	113,903	------	------	200	1,200	5,372	42,976	------	------	------	------	------	------	115,580	736,286
1914	------	------	1,978	12,992	73,811	426,063	19,077	128,986	------	------	250	2,000	------	------	------	------	------	------	------	------	95,116	570,041
1915	------	------	247	1,482	116,340	624,040	19,219	129,873	------	------	650	5,200	485	3,880	------	------	------	------	------	------	136,941	764,475
1916	199	2,587	8,669	42,457	126,369	746,150	19,698	123,596	------	------	800	7,864	------	------	------	------	------	------	------	------	155,735	922,654
1917	135	1,080	17,104	196,633	156,676	1,373,333	43,639	697,566	------	------	1,274	19,110	------	------	------	------	------	------	------	------	218,828	2,287,722
1918	364	5,537	38,475	416,780	132,798	2,887,099	87,604	2,069,185	------	------	1,059	21,243	3,437	64,348	------	------	20	$465	60	$824	263,817	5,465,481
1919	45	450	9,687	150,739	92,729	2,430,361	32,386	883,171	400	$5,600	531	12,826	2,346	37,643	------	------	166	4,784	------	------	138,290	3,525,574
1920	181	3,264	12,852	251,308	120,299	3,096,767	46,091	1,246,942	532	8,672	202	4,040	6,353	101,460	------	------	268	6,094	------	------	186,778	4,718,547
1921	------	------	3,143	39,907	12,477	315,767	15,266	294,513	------	------	567	13,721	3,507	60,186	------	------	------	------	------	------	34,960	724,094
1922	------	------	2,309	20,169	83,855	1,493,188	52,484	970,059	------	------	690	15,353	2,180	30,992	------	------	78	1,404	------	------	141,596	2,531,165
1923	------	------	6,044	59,710	65,045	1,443,490	45,441	945,402	------	------	142	3,160	4,328	50,861	------	------	188	3,196	------	------	121,188	2,505,819
1924	------	------	12,301	135,411	62,067	1,288,310	47,847	988,940	------	------	------	------	2,580	35,178	------	------	184	3,292	------	------	124,979	2,451,131
1925	------	------	11,776	153,707	54,428	1,024,516	44,826	833,794	------	------	------	------	2,639	40,325	------	------	------	------	------	------	113,669	2,052,342
1926	------	------	10,440	[2] 161,269	53,734	1,012,879	62,494	1,167,129	------	------	------	------	1,989	(2)	------	------	------	------	------	------	128,657	2,341,277
1927	------	------	6,432	[2] 130,481	46,006	863,909	57,495	1,040,338	------	------	------	------	2,613	(2)	------	------	------	------	------	------	112,546	2,034,728
	1,742	20,998	154,324	[2] 1,843,071	1,832,664	22,996,841	856,997	13,104,208	932	14,272	7,465	113,617	47,896	[2] 521,615	1,020	6,920	904	19,235	60	824	2,904,004	38,641,601

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[1] Beginning with 1906 figures represent shipments from mines.

[2] Value for New Mexico for 1926 and 1927 included with Colorado.

SHIPMENTS, BY USES

The table that follows shows the relative dependence of the fluorspar industry on the different industries in which fluorspar is used. The predominance of the steel industry as a purchaser of fluorspar is evident. The high value of fluorspar for hydrofluoric acid, glass, and enamel is due to the high quality demanded.

Fluorspar shipped from mines in the United States, 1926–27, by uses

Use	1926				1927			
	Percentage	Short tons	Value		Percentage	Short tons	Value	
			Total	Average			Total	Average
Steel	82.09	105,614	$1,744,085	$16.51	82.81	93,196	$1,523,915	$16.35
Foundry	4.83	6,212	121,453	19.55	4.03	4,533	84,724	18.69
Glass	5.83	7,507	240,288	32.01	5.30	5.968	184,450	30.91
Enamel and vitrolite	2.65	3,410	113,445	33.27	3.39	3,813	119,888	31.44
Hydrofluoric acid and derivatives	2.65	3,410	79,105	23.20	3.33	3,748	98,364	26.24
Miscellaneous	.29	372	7,986	21.47	.80	903	15,880	17.59
	98.34	126,525	2,306,362	18.23	99.66	112,161	2,027,221	18.07
Exported	1.66	2,132	34,915	16.38	.34	385	7,507	19.50
	100.00	128,657	2,341,277	18.20	100.00	112,546	2,034,728	18.08

PRODUCTION OF CRUDE FLUORSPAR

In 1927 fluorspar was produced in four States—Colorado, Illinois, Kentucky, and New Mexico—of which only one, New Mexico, showed an increase.

The production of crude fluorspar in 1927 is estimated at 206,400 short tons, which is equivalent to about 114,500 tons of merchantable fluorspar. The quantity of crude fluorspar treated in 1927 was about 206,000 short tons, from which was recovered 116,400 tons of merchantable fluorspar. Thus, for each ton of merchantable fluorspar recovered in 1927, 1.77 tons of crude fluorspar was handled.

Fluorspar-bearing rock mined, 1926–27, by States, in short tons

State	1926			1927		
	Mines and prospects worked	Fluorspar-bearing rock mined	Merchantable fluorspar equivalent	Mines and prospects worked	Fluorspar-bearing rock mined	Merchantable fluorspar equivalent
Illinois	9	84,575	50,053	9	81,100	45,000
Kentucky	36	133,203	70,585	30	108,700	60,400
Colorado and New Mexico	6	27,475	12,439	16	16,600	9,100
	51	245,253	133,077	55	206,400	114,500

Fluorspar-bearing rock treated and merchantable fluorspar recovered, 1926–27, by States where mined, in short tons

State	1926			1927		
	Fluorspar-bearing rock treated	Merchantable fluorspar recovered	Ratio of treated rock to fluorspar recovered	Fluorspar-bearing rock treated	Merchantable fluorspar recovered	Ratio of treated rock to fluorspar recovered
Illinois	92, 291	55, 088	1. 675	87, 600	49, 000	1. 788
Kentucky	123, 467	63, 616	1. 941	102, 600	59, 400	1. 727
Colorado and New Mexico	26, 916	12, 214	2. 204	15, 700	8, 000	1. 963
	242, 674	130, 918	1. 854	205, 900	116, 400	1. 769

INDUSTRY IN 1927, BY STATES

COLORADO

The shipments of fluorspar from Colorado mines in 1927 amounted to 6,432 short tons, a decrease of 38 per cent from 1926. Of these shipments, 6,257 tons was for use in iron and steel plants and 175 tons was for use in the manufacture of Portland cement.

In 1927 the Wagon Wheel Gap mine, 1¼ miles southwest of Wagon Wheel Gap, in Mineral County, was again the largest producer of fluorspar in Colorado, as well as in the West, but its output was about 40 per cent less than in 1926. All of the product of this mine in 1927 was shipped to the steel plant, at Pueblo, Colo., of the Colorado Fuel & Iron Co., the owner of the mine. In 1926 this company sold the greater part of the output of the Wagon Wheel Gap mine, but in 1927 it not only sold none of its output but again entered the market as a buyer, thus providing a market for Colorado and other western producers of fluorspar. In 1927 the Colorado Fuel & Iron Co. purchased most of the output of the mines in the Jamestown district, Boulder County, and in addition obtained a carload of fluorspar from the Blue Spar mine in Custer County.

In 1927 production of fluorspar in the Jamestown district, Boulder County, was on an enlarged scale. Ten mines were worked, more or less, and yielded 1,647 tons of fluorspar, most of which was shipped without milling. Some of the output of this district, however, was treated at the Lehman mill to which a four-cylinder rod mill, three tables, and a jig were added during 1927.

At the Blue Spar mine in Custer County two carloads of fluorspar were mined in 1927, one carload of which was shipped for use in the manufacture of steel and the other for use in the manufacture of Portland cement.

In 1927 some fluorspar was mined in the course of development work at the Blue Stone claim in Gilpin County, near Tolland. Samples of fluorspar from this claim, analyzed by the Colorado Fuel & Iron Co., showed the following:

Analyses of fluorspar from the Blue Stone claim, Gilpin County

CaF_2	SiO_2	Al_2O_3–Fe_2O_3	$CaCO_3$
Per cent	*Per cent*	*Per cent*	*Per cent*
93. 80	0. 60	2. 12	3. 20
94. 88	1. 97	1. 82	. 94

At the mine in Jackson County, about 3 miles northwest of Northgate, production and development were discontinued until better prices can be obtained for fluorspar. This mine has been one of the chief producers of fluorspar in Colorado in recent years, and from 1922, the year of its initial shipment, to 1926 nearly 15,000 short tons had been shipped.

The names and addresses of the chief shippers of fluorspar from Colorado in 1927 are given below:

Chief shippers of fluorspar from Colorado in 1927

Colorado Fuel & Iron Co	Denver, Colo.
Lehman, E. W	Jamestown, Colo.

ILLINOIS

In 1927 about 81,100 short tons of fluorspar-bearing rock, equivalent to approximately 45,000 tons of merchantable fluorspar, was mined at nine mines or prospects in Illinois. The quantity of fluorspar milled in Illinois in 1927 aggregated about 87,600 short tons, from which was recovered about 49,000 tons of merchantable fluorspar—a loss of 38,600 tons in milling and a ratio of 1.788:1. The shipments of fluorspar from Illinois to consumers in 1927 amounted to 46,006 short tons, or a decrease of 14 per cent from 1926. The fluorspar was reported distributed among the various industries as follows·

Distribution among the various industries of fluorspar from Illinois in 1927

Industry:	Short tons
Steel	38, 325
Foundry	1, 375
Glass	2, 303
Enamel	1, 843
Hydrofluoric acid	2, 078
Portland cement	73
Exported	9
	46, 006

The Daisy mine was again the largest producer of fluorspar in Illinois, although the output was somewhat less than in 1926. The shipments from the Daisy mine, however, particularly of gravel fluorspar, were considerably less than in 1926, resulting in increased stocks at the Rosiclare mill, in which the ore from the Daisy mine is treated. Exploration and development accomplished at the Daisy mine on the Daisy vein, and on the north part of the Rosiclare property on the Rosiclare vein, were satisfactory, and ore reserves were maintained well ahead of mining. Exploration on the north extension of the Rosiclare vein was encouraging, indicating the probability of large reserves in this territory. At the Rosiclare mill, in which improvements were made in 1926 to increase mill efficiency and to give better separation of fluorspar and gangue, further refinements were perfected in 1927, resulting in the recovery of a somewhat larger percentage of high-grade material. This improved practice is expected to give a further increase in production of high-grade material in 1928.

None of the mines of the Franklin Fluorspar Co. in Illinois were worked in 1927; this company centered its activities in Kentucky, where it has a number of mines and well-equipped mills at Marion and Mexico. Its mill in Illinois, however, was run to treat some mill tailings, a small quantity of fluorspar purchased from a local mine, and some fluorspar obtained from cleaning up the property.

The Hillside mine, on the eastern extension of the Rosiclare vein, was worked on a slightly reduced scale in 1927.

At the Spar Mountain mine, about 5 miles northeast of Cave in Rock, Ill., production was nearly 5 per cent less than in 1926, but sales were about 38 per cent more than in the previous year. The ore reserves at this mine were said to have been materially increased during 1927. At the Spar Mountain mill at Cave in Rock, a six-cell jig was installed during 1927.

Small quantities of fluorspar were mined at the Indiana and Twitchell properties in 1927 and shipped to the Franklin mill at Marion, Ky.

The Lee mine near Karbers Ridge produced a small quantity of fluorspar in 1927, which together with a stock pile that was mined several years ago was also shipped to the Franklin mill at Marion.

In 1927 a shaft was sunk on a property near Elizabethtown, Ill., by Outwater, Schwerin & Barnett, who reported reaching ore in December.

The Knight mine, which was being developed in 1926 near Eichorn in Pope County, produced some fluorspar in 1927. The operators of the Knight mine acquired the lease to the Empire mine, which is north of the Knight mine, and these mines are being equipped with larger mill machinery to permit the handling of more crude ore.

A list of producers and shippers of fluorspar in Illinois in 1927, with their post-office addresses, follows.

Producers and shippers of fluorspar in Illinois in 1927

Benzon Fluorspar Co	Cave in Rock, Ill.
Franklin Fluorspar Co	Paducah, Ky.
Hamilton, C. R	Cave in Rock, Ill.
Hillside Fluor Spar Mines	Chicago, Ill.
Knight, E. A. and A. D	Rosiclare, Ill.
Lee Development Co	Karbers Ridge, Ill.
Rodgers, W. J	Evansville, Ind.
Rosiclare Lead & Fluorspar Mining Co	Cleveland, Ohio.

KENTUCKY

In 1927 about 108,700 short tons of fluorspar-bearing rock, equivalent to approximately 60,400 tons of merchantable fluorspar, was mined at 30 mines or prospects in Kentucky. The quantity of fluorspar treated in Kentucky in 1927 was about 102,600 short tons, from which was recovered about 59,400 tons of merchantable fluorspar—a loss of 43,200 tons and a ratio of 1.727: 1.

The shipments of fluorspar from Kentucky to consumers in 1927 amounted to 57,495 short tons, a decrease of 8 per cent from 1926. The shipments were the third largest ever recorded for the State, and for the third time since 1904 they exceeded those of Illinois. The shipments of fluorspar from Kentucky in 1927 were distributed among the industries as follows:

Distribution among the various industries of fluorspar from Kentucky in 1927

Industry:	Short tons
Steel	47, 239
Foundry	2, 397
Glass	3, 575
Enamel	1, 718
Hydrofluoric acid	1, 577
Portland cement	437
Miscellaneous	218
Exported	334
	57, 495

Caldwell County.—In Caldwell County, in which the deposits of fluorspar occur east and southeast of Fredonia and north and northwest of Princeton, about 6,000 tons of run-of-mine fluorspar was produced in 1927, as compared with about 4,000 tons produced in 1926.

The chief producing mine in Caldwell County in 1927 was the Crook mine, 4 miles north from Crider, from which about 5,000 short tons of run-of-mine fluorspar was produced. This mine is not equipped for treating fluorspar; consequently the entire output was sold to the mills at Marion and Mexico, Ky.

At the Marble property, about 4 miles east of Fredonia, considerable fluorspar-bearing material was mined near the surface for a length of about 200 feet along the vein. From this material about 500 short tons of washed gravel fluorspar was recovered. Development work done at this mine in 1926 indicated what was believed by the lessees to be a large supply of fluorspar; but additional work done in 1927 disclosed unfavorable mining conditions, and work was abandoned by the lessees.

The Crider mine, 2½ miles from Crider, the largest producer of fluorspar in Caldwell County in 1926, was idle for the entire year of 1927, and the lease thereto was surrendered on August 3, 1927. The fluorspar in stock at this mine was shipped to the Rosiclare mill at Rosiclare, Ill., where it was prepared for the market.

A carload of run-of-mine fluorspar was produced from a deposit near Princeton. The material was shipped to Marion, Ky., where it was treated in the mill of the Kentucky Fluorspar Co.

Some development work was done during 1927 at the Walker property near Crider. In the course of this work a small quantity of fluorspar was mined but was not sold.

Crittenden County.—In 1927 the Franklin Fluorspar Co. worked, more or less, the Susie Beeler, Beard, Cross, Franklin, Mary Belle, Manley, Memphis, Tyner, and Split Nickel mines, from 5 to 15 miles from Marion, and the Haffaw, Hodge, and Brown mines, about 1 to 4½ miles from Mexico, Ky. In addition the company purchased the entire output of the Davenport, Wright, and Butler mines and some of the output of the Watson, Crook, Marble, Mitchell, and Green mines. This company has well-equipped mills at Marion and Mexico, where the fluorspar from its own mines and that purchased is prepared for the market. The Franklin Fluorspar Co. surrendered its leases to the Tyner and Manley mines on June 1, 1927, and acquired by lease in 1927 the Hodge and Redd mines for 5 and 10 years, respectively. Production at the mines of this company in Kentucky was about one-third less than in 1926, but its sales were only about 9 per cent less than in the previous year.

The Watson (or Liberty Bond) mine, 7 miles southwest of Marion, was idle about 6 months in 1927, due to floods and bad roads; consequently, its production was greatly curtailed. Most of the product sold from this mine in 1927 was of acid grade and was shipped for use in the manufacture of hydrofluoric acid. The remainder comprised both fluxing and grinding grades and was sold to the local mills.

Production and shipments from the mines of the Lafayette Fluorspar Co., near Mexico, Ky., were increased in 1927. Development progressed at Tabb No. 1 and No. 2 shafts on the 250 and 270 foot levels, respectively, during 1927. The Wheatcroft mine was flooded about three-fourths of the year but was reopened in October. A third jig for fluorspar and three pulsator jigs for lead were added to the company's mill; further additions were made to the mill-water supply, and the roads around the property were improved.

The Lucile mine, a short distance south of the railroad station at Marion, yielded about the same quantity of finished fluorspar in 1927 as in 1926. At this mine the main shaft was sunk from the 100 to the 175 foot level, a crosscut was driven to the vein, and drifts on the vein were extended north and south for a distance of 110 and 240 feet, respectively. The drift to the south was in fluorspar the entire distance, but that to the north, although in what is considered a favorable formation, developed no ore. In the south drift raises up to the 150 and 118 foot levels were made and some stoping was done. The work done up to the end of 1927 is said to have indicated an ore body about 250 feet long, 25 to 43 feet deep, and 4 to 15 feet wide.

The Kentucky Fluorspar Co., which has a mill a short distance south of the station at Marion, did 16 per cent more business, by volume, than in 1926; fluxing grades comprised about 68 per cent of its sales in 1927, and ground fluorspar about 32 per cent. This company does not operate any mines but buys part or all of the output of many local mines and prospects. In 1927 the company obtained its supply from the Crook, Nancy Hanks, Pogue, Lucile, Watson, Green, Mitchell, and Holly mines.

The Pogue mine, about 3 miles south of Mexico, produced approximately 8,000 short tons of fluorspar-bearing material in 1927, from which was recovered 4,847 tons of semifinished fluorspar through washing. The material was further milled by the Kentucky Fluorspar Co., to whom it was sold.

The Blue & Marble mine, about 1 mile south of Mexico, was worked on a greatly reduced scale in 1927; its shipments were about 62 per cent less than in 1926.

In 1927 the production at the Holly mine, about 10 miles west of Marion, was about half that of 1926.

The entire output of the Davenport mine, about 8 miles from Marion, was sold to the Franklin mill at Marion. The output of this mine was much less than in 1926. During 1927 the main shaft at the Davenport mine was sunk from the 100 to the 150 foot level and a crosscut was driven 25 feet to the south to a new ore body in which about 200 feet of drifts were run.

Livingston County.—In Livingston County six mines were active in 1927. The chief producer in this county in 1927 was the Nancy Hanks mine, about 1½ miles southeast of Salem and 13 miles southwest of Marion; it produced about four times as much fluorspar as it did in 1926.

The Guill mine, about 1½ miles north of Salem, and the Hudson mine, about 2½ miles southwest of Salem, were the next largest producing mines in Livingston County in 1927. The mining activities at the Hudson mine are directed mainly toward the production of zinc, of which considerable was mined in 1927, but fluorspar also occurs at this mine, and some was produced in 1927.

The remainder of the output from Livingston County in 1927 was from the Mitchell mine, near Lola, and from the Green and Wright mines, near Salem. The Wright mine is a new development and had never before produced any fluorspar.

The list that follows contains the names and office addresses of the chief operators of fluorspar mines or mills in Kentucky in 1927:

Operators of chief fluorspar mines or mills in Kentucky in 1927

Crook, S. L., & Co	Princeton, Ky.
Denny & Haynes	Marion, Ky.
Eagle Fluor Spar Co	Wheeling, W. Va.
Fairview Fluorspar & Lead Co	Marion, Ky.
Franklin Fluorspar Co	Paducah, Ky.
Gugenheim Mining Co	Marion, Ky.
Haynes, C. W	Marion, Ky.
Henry & Frazer	Marion, Ky.
Holly Fluorspar Co	Marion, Ky.
Independent Fluorspar Co	Marion, Ky.
Kentucky Fluorspar Co	Marion, Ky.
Keystone Fluorspar & Lead Co	Hopkinsville, Ky.
Lafayette Fluorspar Co	Duluth, Minn.
Zinc & Spar Co	Wheeling, W. Va.

NEW MEXICO

New Mexico was the only State to record an increase in production and shipments of fluorspar in 1927; the shipments (2,613 short tons) represented an increase of 31 per cent over 1926.

In 1927 the Tortugas mine, near Mesilla Park, Dona Ana County, was again the chief producer and shipper of fluorspar in New Mexico. The product of this mine in 1927 consisted of about 88 per cent of gravel and lump fluorspar, shipped for use in iron and steel plants, and about 12 per cent of ground fluorspar, shipped for use as an ingredient in enamels.

A small quantity of fluorspar was produced at the Sadler mine, near Deming, Luna County, and was shipped to the Tortugas mill, near Mesilla Park, where it was prepared for the market.

The output of the Hot Springs mine, about 4½ miles south of Hot Springs, Sierra County, was confined in 1927 to ground fluorspar, which was shipped to manufacturers of glass and of hydrofluoric acid. Ground fluorspar from this mine was shipped as far east as Pennsylvania and New York. The run-of-mine fluorspar from the Hot Springs mine is hauled by a gasoline locomotive over an industrial railroad, 1 mile long, to a milling plant comprising crusher, decrepitator, vibrating screen, pulverizer, and dust collector; from thence the semifinished ground product is transported about 4½ miles by truck to another milling plant, consisting of concentrator and rotary drier, located on the Rio Grande at Hot Springs, and the finished product is then hauled about 21 miles by truck to Engle, the shipping point.

Producers and shippers of fluorspar from New Mexico in 1927 were as follows:

Producers and shippers of fluorspar from New Mexico in 1927

Fluor Spar Mines of America	Hot Springs, N. Mex.
Hayner & Manasse	Las Cruces, N. Mex.

STOCKS AT MINES OR SHIPPING POINTS

According to the reports of producers the total quantity of fluorspar in stock at the mines or at shipping points at the close of 1927 was 72,633 short tons, an increase of 5 per cent over 1926; this was the largest quantity of fluorspar ever accumulated by producers. These stocks consisted of 23,402 tons of ready-to-ship fluorspar, and of 49,231 tons of crude fluorspar still to be milled which was calculated to be equivalent to about 29,000 tons of ready-to-ship fluorspar. As the quantity of fluorspar in stock piles must be partly estimated, the mine reports vary from year to year, preventing an absolute balance between the quantity mined and that shipped and in stock.

Stocks of fluorspar at mines or shipping points in the United States, 1926–27, by States, in short tons

State	1926			1927		
	Crude [1]	Ready-to-ship	Total	Crude [1]	Ready-to-ship	Total
Arizona	175	225	400	175	225	400
Colorado	1,048	40	1,088	1,180	40	1,220
Illinois	4,516	13,193	17,709	5,075	14,710	19,785
Kentucky	41,419	6,933	48,352	42,043	8,057	50,100
Nevada	250	280	530	250	280	530
New Mexico	810	60	870	460	90	550
Texas	48		48	48		48
	48,266	20,731	68,997	49,231	23,402	72,633

[1] The greater part of this crude (run-of-mine) fluorspar must be beneficiated before it can be marketed.

IMPORTS AND EXPORTS [1]

The total imports of fluorspar into the United States in 1927 amounted to 71,515 short tons, valued [2] at $595,185, and are the second largest ever recorded. The imports in 1927 showed a decrease of 5 per cent in quantity and of 20 per cent in total value from 1926. The value assigned to the foreign fluorspar in 1927 averaged $8.32 a ton. The cost to consumers in the United States includes, in addition, the duty of $5 a short ton, loading charges at the docks, the ocean freight charges, and other charges, besides the freight charges from docks to manufacturers' plants.

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[1] Figures on imports were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce; those on exports were supplied by the producers. No exports of fluorspar are recorded by the Bureau of Foreign and Domestic Commerce.

[2] "The value of imported merchandise * * * is the foreign value or the export value, whichever is higher—that is, the market value or the price at which the merchandise, at the time of exportation to the United States, is offered for sale in the principal markets of the country from which exported, including the cost of containers or coverings and all expenses (including any export tax) incident to placing the merchandise in condition ready for shipment to the United States, as defined in section 402 of the tariff act of 1922."

The imports were equivalent to 64 per cent of the total shipments of domestic fluorspar in 1927, as compared with 59 per cent in 1926.

Complete information is not available as to the uses for which foreign fluorspar was imported, but reports furnished by importers covering about 70 per cent of the total imports in 1927, together with other information and estimates, indicate the following distribution:

Uses for which foreign fluorspar was imported in 1927

[Partly estimated]

	Short tons
Steel and iron	62, 115
Hydrofluoric acid	7, 500
Glass	1, 300
Enamel	600
	71, 515

As shown in the foregoing statement, and as is well known in the industry, the greater part of the imported fluorspar is of fluxing grade and is used in the steel industry. According to reports of the importers of 44,185 short tons of the imported fluorspar sold to steel manufacturers in 1927, the selling price of this quantity at tidewater, duty paid, ranged from $15.71 to $17.81 a short ton and averaged about $16.47.

The selling price of the acid-grade fluorspar, according to the reports received from importers, ranged from $25 to $32.25 a short ton at tidewater, duty paid, and averaged $28.98.

The selling price of imported ground fluorspar, which was sold to manufacturers of glass and enamel, ranged from $30 to $44 a short ton at tidewater, duty paid, and averaged $33.49.

The United Kingdom, which has been the chief source of imported fluorspar, supplied only 26 per cent of the total imported in 1927, the imports of 18,449 tons therefrom representing a decrease of 37 per cent from 1926. Practically all the fluorspar from this source in 1927 was of fluxing grade.

Germany was the chief source of imported fluorspar in 1927 and supplied 45 per cent of the total. The imports of fluorspar from Germany in 1927 amounted to 31,829 tons, or 56 per cent more than in 1926. Although most of the fluorspar imported from Germany in 1927 was of fluxing grade, that country was also the chief source of imported ground fluorspar. Some acid-grade fluorspar was also imported from Germany in 1927.

The imports of fluorspar from France were a little more in 1927 than in 1926, and, except for Germany, France was the only country from which more fluorspar was imported in 1927 than in 1926. A comparatively small quantity of acid-grade fluorspar was imported from France in 1927; the remainder was of fluxing grade.

The imports of 7,069 tons of fluorspar from Africa in 1927 represent a decrease of 17 per cent from 1926. Although all the fluorspar from this source was imported for use in the manufacture of hydrofluoric acid, some of that received in 1927 was of inferior quality.

The imports of fluorspar from Italy decreased from 1,379 tons in 1926 to 449 tons in 1927; all of the fluorspar imported in 1927 was ground material and was sold to manufacturers of glass and enamel.

The importations of fluorspar from Spain in 1927 amounted to 978 tons, or about one-third of those in 1926.

The fluorspar from China, except for 1 ton of high-grade material, was sold to steel manufacturers in California and Washington.

The tariff act of 1922 increased the import duty on fluorspar from $1.50 a long ton ($1.34 a short ton) to $5.60 a long ton ($5 a short ton).

The distances that domestic fluorspar must be transported by rail from mines to steel plants in the Lehigh and Susquehanna Valleys of Pennsylvania are much greater than the distances that foreign fluorspar must be moved from the ports of entry to these plants, so that comparatively little domestic fluorspar is sold to steel plants in this area. Moreover, a large part of the imported material is carried as ballast, making possible a lower market price than would have to be charged if it were carried as a primary cargo. However, foreign fluorspar is not generally of such high grade as the mechanically cleaned domestic product, and, as the value of fluorspar depends mainly upon its purity, comparison of the American fluorspar with foreign fluorspar should be made not merely on the basis of price per ton but on the basis of quality as well.

Fluorspar imported into the United States, 1926–27, by countries

[General imports]

Country	1926			1927		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Africa:						
British South	7,534	$123,734	$16.42	7,069	$90,966	$12.87
British West	610	7,933	13.00			
Portuguese East	362	4,835	13.36			
Belgium	31	566	18.26	21	449	21.38
Canada	1,109	10,310	9.30	560	4,250	7.59
China	645	5,992	9.29	449	3,961	8.82
France	11,163	90,737	8.13	11,711	86,279	7.37
Germany	20,465	171,769	8.39	31,829	230,821	7.25
Italy	1,379	15,434	11.19	449	5,969	13.29
Soviet Russia in Asia	18	277	15.39			
Spain	2,948	33,915	11.50	978	3,650	3.73
United Kingdom	29,407	281,735	9.58	18,449	168,840	9.15
	75,671	747,237	9.87	71,515	595,185	8.32

Producers of fluorspar reported exports in 1927 amounting to 385 short tons, valued at $7,507, or $19.50 a ton, as compared with 2,132 tons, valued at $34,915, or $16.38 a ton, in 1926. All of the exported fluorspar went to Canada in 1927.

Fluorspar reported by producers as exported from the United States, 1920–1927

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1920	2,764	$65,475	$23.69	1924	617	$14,489	$23.48
1921				1925	1,055	17,574	16.66
1922	2,296	40,966	17.84	1926	2,132	34,915	16.38
1923	1,144	25,312	22.13	1927	385	7,507	19.50

USES

The uses of and specifications for fluorspar are discussed in greater detail in Mineral Resources, 1926, part 2, pages 30 to 34.

Metallurgical industries.—Fluorspar has many uses, but its most important use is in the manufacture of steel by the basic open-hearth process. It is also used in the manufacture of alloy steel and ferro-alloys by the electric-furnace process, and in some foundry and other metallurgical operations.

Ceramic industries.—Fluorspar is used in considerable quantities in the glass industry, chiefly for the manufacture of opal or opaque and colored glass; as an ingredient in enamels for various purposes; and in the manufacture of cement, in which it is said that the addition of fluorspar to the raw materials permits the lowering of the fusing point, resulting in considerable economy in fuel, as well as an economy in power, because the clinker obtained is fragile and therefore more easily ground.

Chemical industries.—Fluorspar is the basic material used in the manufacture of hydrofluoric acid. It is also said to be used to facilitate the fusion and contact of ingredients in the manufacture of calcium carbide and cyanamid.

Optical fluorspar.—A very small quantity of clear fluorspar crystals is used for optical purposes; fluorspar is useful in correcting the color and spherical aberration errors in lenses, especially for microscopes and small telescopes.

CONSUMPTION—STOCKS AT CONSUMERS' PLANTS

Figures on consumption of fluorspar in 1926 and 1927 and on stocks at consumers' plants at the close of these years are given in the following table. Although these figures do not include data from all consumers, they are believed not to fall far short of the total for the United States. Thus, the figures for the basic open-hearth steel industry, the chief consumer of fluorspar, include actual figures from the 72 companies that make 99 per cent of the total basic open-hearth steel and estimates for the other 3 companies. Consumption by all the electric-steel and ferro-alloy manufacturers who are known to use fluorspar is represented. The smaller foundries, some of which use a little fluorspar, are not all represented, so that the consumption and stocks for this industry are somewhat incomplete. The figures for fluorspar used in hydrofluoric acid for the two years are not comparable—those for 1927 representing six companies, whereas the figures for 1926 represent only five companies. The consumption and stocks for the glass and enamel industries, although not representing all the consumers, do represent 117 companies and are believed to be practically complete, as these companies include all the larger and probably most of the smaller consumers.

Fluorspar consumed and in stock in the United States, 1926–27, by industries, in short tons

Industry	1926		1927	
	Consumption	Stocks at consumers' plants, Dec. 31	Consumption	Stocks at consumers' plants, Dec. 31
Basic open-hearth steel	142, 000	70, 000	138, 000	85, 000
Electric-furnace steel	4, 800	2, 000	4, 700	1, 200
Foundry	4, 335	1, 400	3, 400	1, 000
Ferro-alloys	462	180	500	100
Hydrofluoric acid and derivatives	7, 591	12, 153	15, 500	13, 000
Enamel and vitrolite	6, 677	935	5, 800	800
Glass	7, 973	1, 342	6, 800	900
Miscellaneous	719	252	1, 500	400
	174, 557	88, 262	176, 200	102, 400

The average quantity of fluorspar used by individual plants per ton of basic open-hearth steel made varies widely, usually ranging from 1 to 35 pounds. In general, the average is between 7 and 8 pounds, which is a very small proportion of the furnace charge. The next table shows over a period of five years the variation in average consumption of fluorspar per ton of basic open-hearth steel in certain plants that make about 80 per cent of the total.

Average consumption of fluorspar per ton of steel, 1923–1927, in pounds

1923	1924	1925	1926	1927
16. 176	19. 295	13. 983	12. 959	13. 315
8. 973	7. 409	7. 893	8. 219	7. 074
6. 416	6. 857	6. 224	5. 700	6. 100
7. 780	5. 365	4. 809	6. 270	7. 067
5. 799	5. 383	4. 568	4. 313	4. 862
6. 475	7. 652	9. 090	11. 225	7. 261
9. 880	8. 747	8. 656	8. 541	8. 572
9. 230	8. 055	4. 992	4. 862	4. 561
7. 980	5. 075	7. 037	5. 523	4. 225
7. 539	7. 350	5. 719	6. 692	6. 320
8. 448	6. 172	6. 684	6. 020	7. 643
7. 251	5. 425	5. 551	4. 289	4. 487
11. 981	14. 178	15. 007	8. 440	11. 509

The table that follows shows the relation of the consumption of fluorspar to the production of basic open-hearth steel for the five-year period 1923–1927, and the stocks of fluorspar at such plants at the close of each of these years. The stocks at the close of 1927 are the largest recorded since such statistics have been collected by the Bureau of Mines.

Consumption and stocks of fluorspar at basic open-hearth steel plants, 1923–1927

	1923	1924	1925	1926	1927
Production of basic open-hearth steel ....long tons..	34, 665, 021	30, 719, 523	37, 087, 342	39, 653, 315	37, 144, 268
Consumption of fluorspar in basic open-hearth steel production..........short tons..	140, 000	119, 800	137, 700	142, 000	138, 000
Consumption of fluorspar per ton of steel made..........pounds..	8. 1	7. 8	7. 4	7. 2	7. 4
Stocks of fluorspar on hand at steel plants at end of year..........short tons..	49, 900	64, 000	49, 400	70, 000	85, 000

CONSUMERS

A directory of consumers of fluorspar in the United States, classified according to the industries in which the mineral is used and each industry arranged alphabetically by States and by location of consuming plant, is given in Mineral Resources, 1926, part 2, pages 38 to 45. The marketing of and markets for fluorspar are discussed in Mineral Resources, 1926, part 2, pages 35 to 38.

WORLD PRODUCTION

The following table was compiled by the Bureau of Mines from official sources so far as possible.

World production of fluorspar, 1923–1927, by countries, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
Australia:					
New South Wales		478			
Queensland		1,894	4,295	2,348	(1)
Canada	126	69	3,525		
France	12,913	23,047	24,423	(1)	(1)
Germany:[2]					
Bavaria	10,543	21,663	31,454	32,475	(1)
Prussia	10,810	13,078	24,101	29,729	(1)
Saxony	5,761	9,032	16,141	17,442	(1)
Great Britain	49,818	50,286	39,706	36,459	38,233
Italy	3,362	6,831	7,770	6,320	5,500
Mexico[3]	500	500	500	500	500
Norway[4]			5		(1)
Russia[5]	14	215	1,211	3,765	(1)
Spain		4,474	2,436	14,011	(1)
Union of South Africa	10,975	10,192	4,883	8,403	(1)
United States	109,939	113,378	103,118	116,715	102,099

[1] Data not available.

[2] In addition to the German States listed, fluorspar is produced in Baden and Thuringia, but data of output are not available.

[3] Estimated annual output.

[4] Exports.

[5] Data for year ended Sept. 30.

CRYOLITE

Cryolite occurs in commercial quantities and is mined at only one place—Ivigtut, Greenland. The greater part of the product is shipped to Copenhagen, and the remainder is exported to the United States, from which some is reexported to Canada. Of the cryolite shipped to the United States, the greater part is used in the metallurgy of aluminum and for making opaque glass.

An article on the cryolite mine at Ivigtut was published in 1926 by Gordon.[3] He discusses the discovery, exploitation, and mining of cryolite and describes the geology and mineralogy of the deposit.

The imports of cryolite into the United States in 1927, according to the Bureau of Foreign and Domestic Commerce, amounted to 5,064 long tons, valued at $410,876, or $81.14 a ton, compared with 7,599 long tons, valued at $557,598, or $73.38 a ton, imported in 1926.

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[3] Gordon, S. G., "Mining cryolite in Greenland": Eng. and Min. Jour.-Press, vol. 121, Feb. 6, 1926, pp. 236–240.

CARBON BLACK PRODUCED FROM NATURAL GAS

By G. R. Hopkins and H. Backus [1]

SUMMARY

A new record for the production of carbon black in the United States was established in 1927 by a total output for the year of 198,429,000 pounds—an increase over 1926 of 17,853,000 pounds, or 10 per cent. The production had a value at the plants of $10,955,000, or an average of 5.5 cents per pound, the same average as in 1926.

The year 1927 witnessed a material expansion of both domestic and foreign trade in carbon black. Total sales amounted to 223,430,000 pounds, an increase over the previous year of 33.4 per cent; of these sales, 168,999,000 pounds was consigned to domestic consumers and 54,431,000 pounds was exported. The brisk demand for carbon black had a material influence on stocks held at plants which, for the first time since statistics of stocks were compiled (1922), showed a decrease from 108,378,000 pounds on December 31, 1926, to 82,831,000 pounds on December 31, 1927. In spite of the increased production, losses at the plants again showed a decrease—a probable reflection of increased efficiency in handling.

Louisiana, or more specifically the Monroe district of that State, easily maintained its position as the center of carbon-black production, although the total production of the State declined from 130,377,000 pounds in 1926 to 124,188,000 pounds in 1927. Texas, however, deserves the greater part of the credit for the record output of 1927; this State produced 56,396,000 pounds in 1927, an increase over 1926 of more than 20,000,000 pounds. Production continued to decline in the two eastern States, Kentucky and West Virginia, and to increase in the Rocky Mountain States of Montana and Wyoming. In 1927 Utah entered the ranks of the producing States for the first time, with an output of nearly 1,000,000 pounds.

No change of consequence was noted in the recovery of carbon black from the natural gas burned. In 1927 the consumption of natural gas for carbon-black purposes was 144,087,000,000 cubic feet, and the average yield of carbon black was 1.4 pounds per M cubic feet, the same average as in 1926.

The tendency toward mergers or consolidations in the carbon-black industry in 1927 was much less pronounced than in 1926, the number of operators remaining at 33 and the number of plants declining from 62 to 61. The westward movement of the industry was evidenced by the growth in importance of Texas, where new plants

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[1] Figures on exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

recently erected in the Panhandle more than compensated for the dismantling of plants in West Virginia.

The export trade in carbon black reached a new high level in 1927—54,431,000 pounds was exported, an increase over 1926 of 39 per cent. The exports had a total value of $4,600,000, an average of 8.5 cents per pound as compared with 9.2 cents in 1926. The United Kingdom retained first place and France second place as importers of carbon black from the United States, although Germany and Canada, which ranked third and fourth, respectively, as importers in 1927, showed a much larger percentage of increase over their 1926 imports.

The channel process remained by far the most important method of manufacturing carbon black; by this method 167,357,000 pounds was manufactured in 1927, or 84 per cent of the total production.

Although no recent figures are available covering the domestic distribution of carbon black as among industries, it is probable that the major portion of the 40,705,000-pound increase in domestic sales can be credited to the rubber industry, which uses approximately half of the carbon black consumed in this country. The output of tires is estimated to have increased 5 per cent over 1926; this increase, combined with the fact that the modern balloon tire uses relatively more carbon black than other types of tires, is the main reason for assuming an increase in the use of carbon black by the rubber industry in 1927.

Summary of statistics of carbon black made from natural gas in the United States, 1923–1927

	1923	1924	1925	1926	1927
Number of producers reporting	47	46	42	33	33
Number of plants	69	69	63	62	61
Quantity produced:					
By States—					
Louisiana ... pounds	101, 398, 881	144, 601, 550	129, 839, 907	130, 376, 987	124, 188, 000
Texas ... do	2, 633, 013	13, 764, 014	26, 219, 510	36, 328, 052	56, 396, 000
Wyoming ... do	([1])	([1])	([1])	([1])	6, 294, 000
Kentucky ... do	10, 058, 887	10, 135, 435	7, 309, 378	6, 309, 826	5, 669, 000
West Virginia ... do	20, 038, 415	15, 045, 448	10, 847, 794	3, 804, 586	2, 796, 000
Other States ... do	4, 133, 452	3, 325, 587	3, 200, 789	3, 756, 725	3, 086, 000
Total ... do	138, 262, 648	186, 872, 034	177, 417, 378	180, 576, 176	198, 429, 000
By processes—					
Channel process ... do	116, 696, 891	162, 257, 725	143, 701, 153	152, 300, 410	167, 357, 000
Other processes [2] ... do	21, 565, 757	24, 614, 309	33, 716, 225	28, 275, 766	31, 072, 000
Stocks held by producers Dec. 31 ... do	38, 320, 814	95, 671, 246	96, 023, 448	108, 378, 101	82, 831, 000
Losses ... do	165, 885	660, 836	1, 433, 850	716, 813	546, 000
Quantity sold:					
Domestic ... do	([3])	([3])	132, 448, 691	128, 294, 321	168, 999, 000
Export ... do	([4])	([4])	43, 182, 635	39, 210, 389	54, 431, 000
Total ... do	102, 210, 496	128, 860, 766	175, 631, 326	167, 504, 710	223, 430, 000
Value (at plants) of carbon black produced:					
Total ... dollars	11, 692, 066	11, 564, 936	9, 639, 585	9, 939, 221	10, 955, 000
Average per pound ... cents	8. 5	6. 2	5. 4	5. 5	5. 5
Estimated quantity of natural gas used ... M cubic feet	109, 096, 000	156, 514, 000	140, 366, 000	130, 321, 000	144, 087, 000
Average yield per M cubic feet ... pounds	1. 3	1. 2	1. 3	1. 4	1. 4

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[1] Included under "Other States."
[2] Including chain, disk, plate, ring, roller, "special," and thermatomic.
[3] Figures not available.
[4] Exports not separately recorded by Bureau of Foreign and Domestic Commerce prior to 1925.

PRODUCTION BY STATES

Carbon black produced from natural gas in the United States, 1926–27, by States

State	Producers reporting	Number of plants	Pounds	Value at plant		Estimated quantity of natural gas used	Average yield per M cubic feet
				Total	Average		
1926					*Cents*	*M cubic ft.*	*Pounds*
Louisiana	22	34	130, 376, 987	$6, 955, 771	5. 3	99, 066, 000	1. 3
Texas	8	10	36, 328, 052	2, 132, 424	5. 9	21, 989, 200	1. 7
Kentucky	2	3	6, 309, 826	322, 642	5. 1	3, 124, 000	2. 0
West Virginia	6	10	3, 804, 586	312, 712	8. 2	2, 586, 000	1. 5
Wyoming	1	1	3, 756, 425	215, 651	5. 7	3, 555, 560	1. 1
Montana	2	2					
Pennsylvania	1	1					
Colorado	1	1	300	21	7. 0	240	1. 3
	[1] 33	62	180, 576, 176	9, 939, 221	5. 5	130, 321, 000	1. 4
1927							
Louisiana	21	34	124, 188, 000	6, 660, 000	5. 4	96, 150, 000	1. 3
Texas	10	13	56, 396, 000	3, 299, 000	5. 8	35, 495, 000	1. 6
Wyoming	2	2	6, 294, 000	369, 000	5. 9	4, 394, 000	1. 4
Kentucky	2	3	5, 669, 000	247, 000	4. 4	3, 187, 000	1. 8
West Virginia	5	6	2, 796, 000	207, 000	7. 4	1, 921, 000	1. 5
Montana	2	2	2, 108, 000	124, 000	5. 9	2, 049, 000	1. 0
Utah	1	1	978, 000	49, 000	5. 0	891, 000	1. 1
	[1] 33	61	198, 429, 000	10, 955, 000	5. 5	144, 087, 000	1. 4

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[1] In counting the total number of producers, a producer operating in more than one State is counted only once.

PRODUCERS

The following list shows the carbon-black producers of the United States (as of January 1, 1928); the arrangement is alphabetical by State, company, and location of plant:

Carbon-black producers of the United States

State and company	County	Nearest town	Process
Kentucky:			
Eastern Carbon Black Co., Post Office Box 27, Charleston, W. Va.	Floyd	Eastern	Disk.
United Carbon Co., Post Office Box 1475, Charleston, W. Va.	do	Langley	Channel.
	Green	Greensburg	Do.
Louisiana:			
Carson Carbon Co., Post Office Box 880, Cincinnati, Ohio.	Morehouse	Collinston	Do.
Century Carbon Co., Monroe, La	Ouachita	Swartz	Do.
Coltexo Corporation, 45 East Forty-second Street, New York, N. Y.	do	Hammock	Do.
Ebony Carbon Co., Warren, Pa	do	Swartz	Do.
J. Smylie Herkness, Route No. 3, Bastrop, La	Morehouse	Bastrop	Do.
J. M. Huber Co. of Louisiana (Inc.), 460 West Thirty-fourth Street, New York, N. Y.	Ouachita	Swartz	Do.
Imperial Oil & Gas Co., 1104 Union Bank Building, Pittsburgh, Pa.	do	Sterlington	Not reported.
Interstate Natural Gas Co. (Columbian Carbon Co., trustee), 45 East Forty-second Street, New York, N. Y.	Union	Spencer	Channel.
Keystone Carbon Co., Monroe, La	Ouachita	Monroe	Do.
Monroe-Louisiana Carbon Co., 45 East Forty-second Street, New York, N. Y.	do	Hancock	Do.
North America Carbon Co., 301 Ardis Building, Shreveport, La.	do	Swartz	Do.
Owl Oil Co. (Inc.) (Eastern Carbon Black Co., owner), Charleston, W. Va.	Caddo	Greenwood	Disk.
Peerless Carbon Black Co., 1709 First National Bank Building, Pittsburgh, Pa.	Ouachita	Bourland	"Special."
	do	Guthrie	Do.

Carbon-black producers of the United States—Continued

State and company	County	Nearest town	Process
Louisiana—Continued.			
Southern Carbon Co., 45 East Forty-second Street, New York, N. Y.	Morehouse	Perryville	Channel.
	do	Spyker	Do.
	Ouachita	Fairbanks	Do.
	do	Fowler	Do.
	do	Swartz	Do.
Texas-Louisiana Producing & Carbon Co., Post Office Box 181, Monroe, La.	do	Not reported	Not reported.
Thermatomic Carbon Co., 108 Ferry Street, Pittsburgh, Pa.	do	Sterlington	Thermatomic.
Tire Carbon Co., 1100 Merchants Building, Shreveport, La.	do	Swartz	Channel.
Union Gas Products Co., 714 Ouachita Bank Building, Monroe, La.	do	do	Light channel.
United Carbon Co., Post Office Box 1475, Charleston, W. Va.	Morehouse	Bastrop	Channel.
	do	Dewdrop	Do.
	Ouachita	Cargas	Do.
	do	Crowbon	Do.
	do	Lamkin	Do.
	do	Phillips	Do.
	do	Swartz (3 plants)	Do.
U. S. Carbon Co., Bastrop, La	Morehouse	Bastrop	Do.
Weston Carbon Co., Warren, Pa	Ouachita	Swartz	Do.
Montana:			
Crystal Carbon Co. (United Carbon Co., owner), Post Office Box 1475, Charleston, W. Va.	Stillwater	Molt	Do.
Gas Products Co., Baker, Mont	Fallon	Baker	Do.
Texas:			
Coltexo Corporation, 45 East Forty-second Street, New York, N. Y.	Stephens	Parks	Do.
J. M. Huber Co. of Louisiana (Inc.), 460 West Thirty-fourth Street, New York, N. Y.	do	Breckenridge (2 plants).	Do.
Magnolia Petroleum Co., Dallas, Tex	Gray	Pampa	Do.
	Stephens	Breckenridge	Do.
	Wheeler	Lela	Do.
Peerless Carbon Black Co., 1709 First National Bank Building, Pittsburgh, Pa.	Eastland	Pioneer	"Special."
Texas Carbon Industries (Inc.), Breckenridge, Tex.	Stephens	Breckenridge (2 plants).	Channel.
Texas Elf Carbon Co., 940 Old South Building, Boston, Mass.	do	Eliasville	Do.
United Carbon Co., Post Office Box 1475, Charleston, W. Va.	Hutchinson	Borger	Do.
Western Carbon Co., 45 East Forty-second Street, New York, N. Y.	Eastland	Pioneer	Do.
	Hutchinson	Borger	Do.
Utah: Crystal Carbon Co. (United Carbon Co., owner), Post Office Box 1475, Charleston, W. Va.	Grand	Cisco	Do.
West Virginia:			
Godfrey L. Cabot (Inc.), 940 Old South Building, Boston, Mass.	Boone	Seth (2 plants)	Roller and channel.
Columbian Carbon Co., 45 East Forty-second Street, New York, N. Y.	Logan	Chapmanville	Channel.
Eastern Carbon Black Co., Post Office Box 27, Charleston, W. Va.	Kanawha	Shrewsbury	Do.
Imperial Oil & Gas Co., 1104 Union Bank Building, Pittsburgh, Pa.	Ritchie	Harrisville	Do.
Monarch Carbon Co., 704 Union Trust Building, Charleston, W. Va.	Kanawha	Glasgow	Do.
Wyoming:			
J. M. Huber Co. of Louisiana (Inc.), 460 West Thirty-fourth Street, New York, N. Y.	Niobrara	Manville	Do.
Teton Gas Products Co., 45 East Forty-second Street, New York, N. Y.	Fremont	Riverton	Do.

EXPORTS

Carbon black exported from the United States, 1926–27, by countries

Country	1926		1927	
	Pounds	Value	Pounds	Value
Australia	1, 496, 699	$143, 855	2, 624, 908	$238, 083
Belgium	945, 839	89, 058	988, 363	84, 282
Canada	4, 665, 295	360, 545	8, 988, 589	638, 560
China	602, 721	54, 628	598, 914	49, 586
France	9, 288, 361	857, 473	9, 796, 750	833, 980
Germany	4, 307, 441	403, 249	9, 299, 871	837, 418
Italy	2, 427, 619	232, 118	3, 158, 463	275, 491
Japan	2, 816, 969	270, 545	3, 257, 831	288, 395
Netherlands	492, 126	50, 262	1, 102, 116	100, 581
United Kingdom	11, 010, 065	1, 039, 182	13, 200, 486	1, 116, 402
Other	1, 157, 254	121, 992	1, 414, 520	136, 956
	39, 210, 389	3, 622, 907	54, 430, 811	4, 599, 734

GRAPHITE

By Jefferson Middleton

PRODUCTION

In the following discussion the quantity and value of graphite sold or used by producers in the United States are presented as the best available measure of output. The actual quantities mined and prepared for market have not been recorded.

During 1927 the graphite industry in the United States advanced on the whole, although the total sales by producers decreased slightly. The increased cost of imported graphite had the effect of stimulating the industry in the United States; the number of active producers reporting increased from 6 in 1926 to 9 in 1927, the largest number reporting since 1920. The production of crystalline graphite also increased considerably.

In Alabama, the scene of great activity during the war, the industry had almost died out, but in 1926 and 1927 it revived. In 1927 three Alabama operators reported sales of 3,474,000 pounds of crystalline graphite, or two-thirds of the total for the United States.

In 1927 the Southwestern Consolidated Graphite Co., which has been operating for a number of years in Texas, acquired the plant of the Ceylon Co. at Hollins, Ala., and carried on extensive operations there also. The Bama Graphite Mines, successor to the Flaketown Graphite Co., and the Superior Flake Graphite Co. were the other producers in Alabama in 1927. The Alabama-Quenelda Graphite Co., successor to the Quenelda Graphite Corporation, expects to operate during 1928. In 1927 the Standard Graphite Corporation began the production of crystalline graphite in California, and the State thus again became a producer after four years of inactivity. In Michigan the only operator was the Detroit Graphite Co. In Montana the Crystal Graphite Co. was active mainly in perfecting milling processes. The only operator in Nevada in 1927 was the Carson Black Co. In Rhode Island the Graphite Mines Co. continued the production of amorphous graphite. In Virginia experiments in the purification of amorphous graphite were carried on, but the work had not reached a commercial scale at the end of the year.

The quantity of natural graphite sold or used by producers in the United States decreased from 5,470 short tons in 1926 to 5,207 tons in 1927, or 5 per cent. The quantity of amorphous graphite decreased 380 tons, or 13 per cent, compared with 1926. The output of crystalline graphite continued to increase and in 1927 amounted to 5,224,400 pounds—5 per cent more than in 1926; the output in 1927 was the largest in any year since 1920. Crystalline graphite in 1927 exceeded amorphous graphite in amount sold or used by producers for the first time since 1920. The total value of amorphous graphite sold or used by producers decreased $4,650, or 11 per cent, and the value of the crystalline variety increased $18,279, or 10 per cent, compared with 1926. The same States produced amorphous graphite in 1927 as in 1926—Michigan, Nevada, and Rhode Island. The States producing crystalline graphite in 1927 were Alabama, California, Montana, and Texas. Alabama was the source of two-thirds of the total output of crystalline graphite in 1927 and displaced Texas, which led in 1926. Rhode Island was the largest source of amorphous graphite in 1927.

Natural graphite sold or used by producers in the United States, 1918–1927

Year	Number of operators reporting sales	Amorphous		Crystalline		Total value
		Short tons	Value	Pounds	Value	
1918	42	6, 560	$69, 455	12, 861, 839	$1, 454, 799	$1, 524, 254
1919	20	3, 379	47, 716	8, 086, 191	731, 141	778, 857
1920	17	4, 694	49, 758	9, 632, 360	576, 444	626, 202
1921	8	1, 842	20, 860	1, 189, 523	75, 664	96, 524
1922	7	2, 200	(1)	1, 849, 766	85, 242	(1)
1923	7	4, 056	39, 560	3, 964, 900	151, 434	190, 994
1924	5	4, 071	38, 533	1, 800, 325	48, 977	87, 510
1925	6	3, 536	39, 640	2, 257, 250	56, 721	96, 361
1926	6	2, 975	40, 500	4, 989, 200	178, 842	219, 342
1927	9	2, 595	35, 850	5, 224, 400	197, 121	232, 971

[1] Bureau of Mines not at liberty to publish value.

USES

Natural graphite is used chiefly in the manufacture of foundry facings, pigments and paints, crucibles, pencils, commutator brushes, stove polish, lubricants, retorts, and batteries. During the last few years the use of graphite in the United States has undergone radical changes. Uses that a few years ago consumed a large proportion of the supply are now relatively of minor importance, and uses which were unimportant have become important. Before the World War the manufacture of graphite crucibles consumed more than one-half of the supply; in 1923 only 15 per cent of the graphite used in the manufacture of finished products was used in the manufacture of crucibles and in 1924 only 13 per cent. Foundry facings used only 10 per cent of the graphite in 1913; the quantity so used in 1923 was 44 per cent, and in 1924 it was 52 per cent. Other uses that were minor before the war and are now of much importance are in pigments and paints, pencils and crayons, commutator brushes, stove polish, and lubricants.

MANUFACTURED GRAPHITE

Graphite is manufactured by the Acheson Graphite Co., at Niagara Falls, N. Y. This branch of the industry was started in 1897, under patents obtained by Dr. E. G. Acheson, and was developed so rapidly that after 10 years the production of artificial graphite exceeded that of natural crystalline graphite. Since 1910, except for 1915 to 1920, the output of manufactured graphite has exceeded annually the combined output of domestic amorphous and crystalline graphite. The figures that follow are published by permission of the company.

Graphite manufactured by the Acheson Graphite Co., 1918–1927, in pounds

1918	9, 182, 272	1923	26, 761, 015
1919	8, 163, 177	1924	10, 986, 192
1920	7, 399, 749	1925	12, 135, 655
1921	5, 888, 000	1926	21, 163, 986
1922	13, 031, 926	1927	12, 257, 239

PRICES

In 1927 the average value of domestic crystalline graphite at the mine ranged from about 2½ to 7 cents a pound, compared with 3 to 6 cents in 1926 and 2½ to 10 cents in 1925.

The following table is based on information supplied prior to 1920 by importers; since then the figures have been furnished by Charles Pettinos, of New York:

Average prices of Ceylon graphite c. i. f. New York, 1918–1927, in cents per pound

Year	Lump		Chip		Dust		Remarks
	First grade	Second grade	First grade	Second grade	First grade	Second grade	
1918	15¼-28½	14 -22	12½-21½	11 -18½	10½-12	9 -10	High first half; low second half.
1919	14 -15¼	12 -13	10 -11	8 - 9	6¾- 7½	5 - 6	Low throughout the year.
1920	9 -14	7 -11	7 -10	5½- 7½	5 - 7	3½- 5	High first half; low second half.
1921	5½- 6	4½- 5	4½- 5	3½- 4	3¼- 3¾	2 - 2½	Low throughout the year.
1922	5 - 6	4 - 4½	3¾- 4¼	3¼- 3¾	3 - 3½	2 - 2½	Do.
1923	5 - 6	4 - 4½	3¾- 4¼	3¼- 3¾	3 - 3½	2 - 2½	Do.
1924	5½- 7	4½- 6	4 - 6	3½- 5	3¼- 4½	2 - 3	Low first three-quarters; high last quarter.
1925	7½- 9½	6½- 8½	6½- 7½	5½- 6½	3½- 5½	3 - 4½	High throughout the year.
1926	7½- 9½	6½- 8½	6½- 7½	5½- 6½	3½- 5½	3 - 4½	Do.
1927	7½- 9½	6½- 8½	6½- 7½	5½- 6½	3½- 5½	3 - 4½	Do.

Madagascar.—The following information has also been furnished by Mr. Pettinos: The price range for 1927 for Madagascar graphite was from 6½ to 7 cents per pound, ex dock at New York, including duty and other charges, compared with 6½ to 8 cents in 1926.

The exports from Madagascar are virtually all of one quality, called "Standard No. 1 Flake," the grade that the French Government is attempting to have the producers maintain, with a graphitic carbon content of approximately 85 per cent. The size of grain runs from 20 to 60 mesh; all should pass the 20-mesh and remain on the the 60-mesh screen.

IMPORTS AND EXPORTS [1]

In 1927 the quantity of graphite imported for consumption increased 1,286 short tons, or 8 per cent, but the value decreased $197,310, or 21 per cent, compared with 1926. Amorphous graphite has for several years constituted more than one-half (55 per cent in 1927) of the total quantity of graphite imported; the value of the crystalline graphite imported in 1927 was 80 per cent of the total. The small part of the total value of imports represented by amorphous graphite is at least partly accounted for by the fact that the large imports from Mexico are crude amorphous graphite of very low value.

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[1] **Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.**

The reports of the Bureau of Foreign and Domestic Commerce on imports show only the country from which the graphite is shipped, and that is not always the country of origin. For instance, the graphite shown as imported from France probably originated in Madagascar, and that imported from Great Britain should probably be credited to Ceylon and possibly in part to Madagascar. The shipments credited to Japan probably consisted wholly of graphite from Chosen.

Graphite imported for consumption in the United States, 1918–1927, by kinds

Year	Amorphous		Crystalline chip or dust		Crystalline flake		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1918	(1)	(1)	(1)	(1)	(1)	(1)	19,498	$3,092,475
1919							26,626	2,978,096
1920							21,095	1,711,312
1921							8,183	452,076
1922							12,488	473,046
1923	11,252	$149,831	7,243	$426,417	939	$37,871	19,434	614,119
1924	10,936	113,751	3,998	197,867	1,441	87,893	16,375	399,511
1925	9,210	143,750	5,904	389,242	2,654	293,418	17,768	826,410
1926	8,250	161,564	5,258	433,848	2,658	325,821	16,166	921,233
1927	9,559	146,881	6,116	390,822	1,777	186,220	17,452	723,923

[1] Not separately classified prior to 1923.

Graphite imported into the United States, 1922–1927

[General imports]

Country	1922		1923		1924	
	Short tons	Value	Short tons	Value	Short tons	Value
Aden			111	$1,489		
Austria			59	1,364	5	$180
Canada	533	$17,392	893	37,384	1,137	58,628
Ceylon	7,114	324,826	7,244	392,350	3,632	171,804
China					253	3,905
Chosen			1,705	24,262	251	2,768
Denmark			1	50		
France	1,305	52,275	843	32,176	851	57,009
Germany	6	425	4	389	2	282
Greenland			67	600		
India (British)	102	6,852	298	23,059	171	8,450
Italy	35	1,045	474	7,487	155	3,204
Japan	1,171	29,819	2,106	34,912	479	8,362
Madagascar			183	5,146	429	11,145
Mexico	2,196	40,954	5,765	41,339	8,984	70,380
Netherlands	(1)	4				
Siam			56	2,929		
Switzerland					17	1,944
United Kingdom: England	144	7,369	8	1,400	9	1,450
	12,606	480,961	19,817	606,336	16,375	399,511

[1] Less than 1 ton.

Graphite imported into the United States, 1922–1927—Continued

Country	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada	2,268	$123,823	2,633	$178,249	1,676	$98,079
Ceylon	5,616	365,371	4,795	390,336	5,957	367,593
China	88	1,502	----------	----------	9	692
Chosen	439	5,330	(2)	(2)	(2)	(2)
France	2,052	230,056	723	96,811	1,419	156,154
French Indo-China	----------	----------	----------	----------	2	173
Germany	25	3,256	126	13,217	7	1,089
India (British)	5	150	122	8,170	----------	----------
Italy	575	16,688	105	2,291	27	694
Japan	191	9,983	[2] 880	[2] 21,794	[2] 1,834	[2] 25,176
Java and Madura	----------	----------	61	4,041	----------	----------
Madagascar	168	10,466	1,014	108,846	162	12,459
Mexico	6,159	39,119	5,238	45,968	6,283	53,837
Morocco	----------	----------	----------	----------	42	4,529
Norway	----------	----------	14	2,078	1	61
Switzerland	13	1,600	----------	----------	3	471
United Kingdom	180	20,738	483	51,712	7	997
	17,779	828,082	16,194	923,513	17,429	722,004

[2] Chosen included with Japan.

Graphite exported from the United States, 1918–1927

Year	Unmanufactured graphite		Manufactures of graphite [1]	Year	Unmanufactured graphite		Manufactures of graphite [1]
	Short tons	Value			Short tons	Value	
1918	954	$121,555	$731,518	1923	908	$138,542	$335,778
1919	629	90,185	788,755	1924	1,022	144,108	250,957
1920	607	112,771	610,261	1925	945	142,122	337,481
1921	921	95,998	679,359	1926	405	49,235	463,084
1922	569	78,094	255,019	1927	[2] 1,819	[2] 435,997	(2)

[1] After 1921, exclusive of crucibles, figures for which are not available.
[2] Classification for 1927 reads "Graphite and manufactures, except crucibles."

WORLD PRODUCTION

The following table shows, so far as figures are available, the production of natural graphite throughout the world from 1923 to 1927:

World's production of natural graphite, 1923–1927, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
Australia:					
New South Wales	----------	----------	----------	----------	10
Northern Territory	----------	3	----------	----------	----------
Austria	9,403	9,523	13,079	14,756	(1)
Canada	1,010	1,210	2,331	2,474	1,676
Ceylon [2]	10,840	9,806	15,674	11,810	13,091
Chosen [2]	13,576	16,032	15,040	18,692	(1)
Czechoslovakia	9,873	11,935	18,466	30,818	(1)
France	190	514	1,139	(1)	(1)
Germany	20,856	10,079	16,853	14,304	(1)
Greenland [3]	60	53	32	----------	----------
Indo-China	----------	2,264	[3] 221	[3] 815	[3] 410
Italy	5,691	7,740	9,937	9,605	7,300
Japan	801	767	1,010	498	(1)
Madagascar [2]	10,768	11,556	14,980	11,454	14,329
Mexico (amorphous)	5,489	8,023	6,264	4,435	5,837
Russia [4]	(1)	169	1,298	5,207	(1)
Spain	----------	----------	1,945	603	(1)
Union of South Africa	54	50	47	46	58
United States:					
Amorphous	3,680	3,693	3,208	2,699	2,354
Crystalline	1,798	816	1,024	2,263	2,370

[1] Data not available. [2] Exports. [3] Concentrates. [4] Year ended Sept. 30.

The following extract from the Mining Journal, London, March 24, 1928, page 238, in regard to graphite mining in Ceylon in 1927 may be of interest:

> A review of the graphite industry in Ceylon for 1927, made by the Ceylon Chamber of Commerce, indicates that the market has continued in a depressed state during the year, and that there has been no encouragement for the small mine owners to recommence operations. The low rates for the product ruling throughout the year have also militated against some of the bigger mines reopening, owing to the high cost of pumping operations and the increased cost of labor.
>
> Ceylon has always been noted for its high grade of lump graphite for crucibles, and the demand for this grade has fallen off considerably, but there has been a greatly increased demand for carbon lump. The falling off in the demand for crucible graphite is greatly due to the more extended use of Madagascar graphite for this purpose.
>
> The exports of Ceylon graphite for 1927 show a slight increase over 1926, but the average value per ton shows a decline of about Rs.28, the actual exports amounting to 258,122 hundredweights, as compared with 232,352 hundredweights.
>
> America was again the biggest buyer and consumer, taking 97,142 hundredweights, with Germany second, taking 60,560 hundredweights, an increase of 25,326 hundredweights over 1926. The United Kingdom shows a big falling off, taking only 26,171 hundredweights, against 58,376 hundredweights the previous year.

FULLER'S EARTH

By Jefferson Middleton

GENERAL CONDITIONS

The fuller's earth industry continued to show progress in 1927; the product sold or used by producers in the United States increased both in quantity and value. The output for 1927—264,478 short tons, valued at $3,767,038—was reported by 16 operators, an increase of 2 compared with 1926, in 7 States. The quantity was the largest ever recorded; it was 13 per cent greater than that of 1926 and nearly four times that of 1917. The value of the output was also the highest ever reported; it was 12 per cent more than that of 1926 and nearly five times that of 1917. The average value per ton declined 9 cents compared with 1926. The imports of fuller's earth decreased 17 per cent in quantity and 12 per cent in value compared with 1926 and were the smallest in quantity, with the exception of 1924, since 1897.

The apparent consumption of fuller's earth in the United States in 1927 was about 260,000 tons. The domestic earth used constituted 97 per cent of the total.

The reuse or revivication of spent fuller's earth is still engaging the attention of users of this material, especially with regard to the clays used in the West in the contact method of filtration. A report bearing on this subject, "Production of lubricating oils using fine clays," by E. R. Lederer, with discussions by W. Miller, H. S. Bell, A. E. Miller, and others, was read at the February, 1927, meeting of the American Institute of Mining and Metallurgical Engineers, and was published by the institute in its volume, Petroleum Development and Technology, 1926. An article by H. L. Kaufmann, "Design and operation of a contact filter plant," appeared in Chemical and Metallurgical Engineering, volume 34, March, 1927, pages 155–158, and should be of value to those interested in the development of this method of filtering mineral oils.

OCCURRENCE

Occurrences of fuller's earth have been reported in Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Illinois, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New York, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Virginia, and Washington, but in 1927 it was produced only in Arizona, Florida, Georgia, Illinois, Massachusetts, Nevada, and Texas.

USES

Fuller's earth is used mainly as a filtering medium in clarifying or bleaching fats, greases, and mineral and vegetable oils. Its original use was in fulling woolen cloth, and from that it derived its name, but such use, at least in this country, has almost been abandoned. Fuller's earth is also said to be used in the manufacture of pigments for printing wall paper, in detecting certain coloring matters in some food products, as a substitute for talcum powder, and in medicine as a poultice and as an antidote for alkaloid poisons. Another suggested use is in deliming hides in the manufacture of leather. It has been stated that the fuller's earth cake from oil mills can be used in the manufacture of hand soaps, concrete waterproofing, and asphalt preparations.[1]

HISTORY

Fuller's earth was first discovered in the United States in 1891 near Alexander, Ark., by John Olsen. The mineral was used for a time by the Southern Cotton Oil Co., at Little Rock, Ark., but its use was finally abandoned.[2] The real beginning of the industry in this country, however, was in 1893, near Quincy, Fla., when quite by accident, in an unsuccessful effort to burn brick on the property of the Owl Cigar Co., an employee called attention to the close resemblance between the clay used and the German fuller's earth. This discovery in Florida caused considerable excitement, and deposits of fuller's earth were reported from a number of States, but the material in most of these deposits was found to have no value as fuller's earth. Production began in Florida almost immediately after the discovery, and from 1897 to 1899 fuller's earth was produced in Florida, Colorado, New York, and Utah. Florida maintained its rank as the leading producer continuously until 1924. In 1901 Arkansas again became a producer. From 1904 to 1907 Arkansas was the second largest producer, but no production of fuller's earth has been reported from Arkansas since 1922. Fuller's earth was found in Georgia soon after the discovery in Florida, but Georgia did not become a producer until 1907, when it ranked third as a producing State; it ranked second from 1909 to 1923, except in 1918 and 1919 when Texas was second; and since 1924 it has ranked first. In 1904 Alabama and Massachusetts, in 1907 South Carolina and Texas, in 1909 California, in 1918 Nevada, and in 1922 Illinois and Pennsylvania first appeared as producers. Pennsylvania has reported no production since 1922.

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[1] Chemical and Metallurgical Engineering: Vol. 26, Mar. 29, 1922, p. 602.

[2] Branner, J. C., "An early discovery of fuller's earth in Arkansas": Trans. Am. Inst. Min. Eng., vol. 4 3, pp. 520-522, 1913.

PRODUCTION

Fuller's earth sold or used by producers in the United States, 1918–1927

Year	Operators reporting sales	Short tons	Value at mines	
			Total	Average
1918	14	84,468	$1,146,354	$13.57
1919	10	106,145	1,998,829	18.83
1920	12	128,487	2,506,189	19.51
1921	12	105,609	1,973,848	18.69
1922	15	138,944	2,289,719	16.48
1923	15	149,134	$2,247,523	$15.07
1924	13	177,994	2,632,342	14.79
1925	14	206,574	2,923,965	14.15
1926	14	234,152	3,356,482	14.33
1927	16	264,478	3,767,038	14.24

The small number of producers in many of the States makes it impossible to publish totals for these States without revealing data for individual establishments. The South continues to lead in the production of fuller's earth; 76 per cent of the output in 1927 was produced in Florida, Georgia, and Texas, compared with 82 per cent from these States in 1926. The increased production of Nevada, which in 1927 amounted to 32,903 tons, or 12 per cent of the total, accounts for the decrease in the proportion of fuller's earth reported by the South. In 1927 Georgia was the leading State in quantity and value, with Florida second. Nevada ranked third in quantity in 1927, displacing Illinois. The quantity and value of the output increased in every important producing State except Illinois and Texas. The production in Texas in 1927 was 26,938 tons, valued at $283,400, compared with 30,258 tons, valued at $300,169, in 1926.

IMPORTS AND EXPORTS

Imports of fuller's earth, which once constituted the entire supply, were increasing before the World War and reached their maximum in 1914. Since that time the general trend has been downward. In 1925 and 1926 there were slight increases—10 per cent in quantity in the former and 14 per cent in the latter year as compared with the preceding year in each case. In 1927 there was a decrease of 17 per cent in quantity and 12 per cent in value as compared with 1926. In 1927 wrought or manufactured earth constituted 93 per cent of the total quantity and 95 per cent of the total value of fuller's earth imported.

Fuller's earth imported for consumption in the United States, 1918–1927 [1]

Year	Unwrought or unmanufactured			Wrought or manufactured			Total		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average		Total	Average		Total	Average
1918	1,085	$12,636	$11.65	15,837	$213,599	$13.49	16,922	$226,235	$13.37
1919	373	4,301	11.53	13,500	185,410	13.73	13,873	189,711	13.67
1920	1,518	19,793	13.04	17,497	202,100	11.55	19,015	221,893	11.67
1921	483	6,172	12.78	9,261	113,243	12.23	9,744	119,415	12.26
1922	607	7,413	12.21	9,962	128,282	12.88	10,569	135,695	12.84
1923	642	8,252	12.85	7,905	105,692	13.37	8,547	113,944	13.33
1924	296	3,385	11.44	7,006	89,103	12.72	7,302	92,488	12.67
1925	215	2,619	12.18	7,800	108,676	13.93	8,015	111,295	13.89
1926	158	2,290	14.49	8,940	121,384	13.58	9,098	123,674	13.59
1927	550	5,679	10.33	7,030	103,602	14.74	7,580	109,281	14.42

[1] Compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Exports of fuller's earth are not shown in the official records of the foreign commerce of the United States, but six operators reported to the Bureau of Mines that they exported 12,287 short tons in 1927 to Argentina, Canada, Cuba, England, Germany, Mexico, Peru, Russia, and Scotland. This is an increase of 85 per cent over 1926, and is by far the largest quantity ever reported by producers as having been exported.

POTASH

By A. T. Coons

PRODUCTION AND SALES

Production of potash in the United States during 1927 showed an increase over 1926 of 66 per cent in crude potassium salts and of 86 per cent in the potash (K_2O) content. The average per cent of K_2O in the salts produced was 56.6 in 1927, as compared with 50.4 per cent in 1926.

Sales of crude potassium salts in 1927 were 84 per cent more and the potash content of the material sold 98 per cent more than in 1926. The total value of the potassium salts sold in 1927 was 126 per cent more than in 1926, and the value per unit (20 pounds of K_2O) was 49 cents, as compared with 43 cents in 1926. Both production and sales were larger in 1927 than in any other year since 1920. As in 1925 and 1926, the sales were larger than the production.

The stocks remaining in producers' hands decreased about 72 per cent. Two more plants reported production in 1927 than in 1926, one less reported sales, and four more reported stocks remaining on hand.

Tables of sales by States and by sources are omitted to avoid disclosing individual production. A summary of production, sales, and producers' stocks of potassium salts in the United States for the past 10 years is given in the following table:

Potassium salts produced, sold, and in stock in the United States, 1918–1927

Year	Production			Sales				Stocks		
	Number of plants	Crude potassium salts (short tons)	Content of K_2O (short tons)	Number of plants	Crude potassium salts (short tons)	Content of K_2O (short tons)	Value f. o. b. plant	Number of plants	Crude potassium salts (short tons)	Content of K_2O (short tons)
1918	128	207, 686	54, 803	(1)	140, 343	38, 580	$15, 839, 618	(1)	67, 343	16, 223
1919	102	116, 634	32, 474	(1)	166, 063	45, 728	11, 271, 269	(1)	(1)	(1)
1920	66	166, 834	48, 077	64	139, 963	41, 444	7, 463, 026	38	32, 378	8, 999
1921	20	25, 485	10, 171	23	10, 337	4, 408	447, 859	30	32, 925	12, 625
1922	12	25, 176	11, 714	16	22, 028	11, 313	463, 512	16	30, 100	11, 653
1923	12	39, 029	20, 215	11	35, 164	19, 281	784, 671	14	34, 794	12, 363
1924	12	43, 734	22, 903	9	37, 492	21, 880	842, 618	11	32, 389	10, 770
1925	9	51, 565	25, 448	7	52, 823	25, 802	1, 204, 024	7	[2] 30, 919	10, 276
1926	7	46, 324	23, 366	6	51, 369	25, 060	1, 083, 064	4	[3] 26, 000	[3] 9, 000
1927	9	76, 819	43, 510	5	94, 722	49, 500	2, 448, 146	8	7, 250	2, 500

[1] Figures not available.
[2] Of this quantity 212 tons was lost by leaching, etc.
[3] Estimate.

PRODUCING LOCALITIES

In 1927 the potassium salts produced were from natural brines, from flue dusts of blast furnaces, from the waste from molasses distillation, from Steffen's water, and from glauconite. A small amount of alunite was utilized for experimental work. The American Potash & Chemical Corporation, 233 Broadway, New York, N. Y., the chief American producer of potassium salts, also recovered borax and other natural sodium salts as by-products from its plant at Trona (Searles Lake), San Bernardino County, Calif. Its output of potassium salts increased 108 per cent in 1927, and somewhat less was marketed than produced. The product sold by this company has a higher content of potash (K_2O) than that of any other company, and the per cent in 1927 (60.14) was higher than in 1926 (58.33). The plant of the United States Industrial Chemical Co. (address, 110 East Forty-second Street, New York, N. Y.), at Baltimore, Md., was the second largest producer of potassium salts in 1927. The salts averaged 34 per cent K_2O, were mixtures of sulphates, chlorides, and small amounts of carbonates, and were recovered from the waste from molasses distillation. This is the fourth year of potash production for this company. Its sales in 1927 were over three times its production, and its stock on hand January 1, 1928, was greatly diminished. Potassium salts (chiefly sulphates), from flue dusts of blast furnaces, were produced and sold at the Lucy and Isabella furnaces of the Carnegie Steel Co. (Pittsburgh, Pa.). A small amount of alunite was shipped from Marysvale, Utah, by the American Alunite Chemical & Fertilizer Co., and was used for experimental tests. The Electro Co., Odessa, Del., made a small output of potash alum from glauconite (greensand marl) obtained in Delaware. The Holland-St. Louis Sugar Co., Holland, Mich., reported a small quantity of potassium salts in the form of concentrated Steffen's waste water. The Bureau of Mines is also informed that in 1927 experimental work was done in California on improved methods for recovery of potassium salts from cement dust.

The results of investigations of potash deposits in Texas, New Mexico, and other potash-bearing localities, as carried on by the Bureau of Mines, the Geological Survey, and other Government bureaus, are published in separate pamphlets and are not reviewed here.

IMPORTS AND EXPORTS[1]

Imports of potash materials are shown in the following tables. The materials are classified as salts used chiefly in the fertilizer industry and as those used chiefly in the chemical industries. The former class, which includes kainite, manure salts, muriate, and sulphate, constituted nearly 92 per cent of the total imports.

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[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Potash materials imported for consumption in the United States, 1926–27 [1]

Material	Approximate K_2O content (per cent)	1926				1927			
		Short tons	Content of K_2O: Short tons	Content of K_2O: Percentage of total	Value	Short tons	Content of K_2O: Short tons	Content of K_2O: Percentage of total	Value
Used chiefly in fertilizers:									
Kainite	12.4	203,702	25,259	9.5	$1,225,166	115,345	14,303	6.3	$815,009
Manure salts	20.0	354,413	70,883	26.6	3,391,100	311,357	62,271	27.7	3,676,535
Muriate (chloride)	50.0	223,049	111,525	41.9	6,195,830	183,475	91,738	40.8	5,739,097
Sulphate	48.6	78,258	38,033	14.3	2,823,058	77,172	37,506	16.7	2,947,969
		859,422	245,700	92.3	13,635,154	687,349	205,818	91.5	13,178,610
Used chiefly in chemical industries:									
Bicarbonate	46.0	263	121	------	30,747	242	111	------	28,125
Bitartrate (argols)	20.0	12,837	2,567	1.0	1,791,160	12,451	2,490	1.1	2,288,968
Bitartrate (cream of tartar)	25.0	124	31	------	30,904	130	33	------	50,030
Bromide	39.6	35	14	------	18,549	10	4	------	7,075
Carbonate, crude	61.0	5,762	3,515	1.3	533,840	6,596	4,024	1.8	619,430
Carbonate, crude or black salts	50.0								
Carbonate, refined	67.0								
Caustic	80.0	6,483	5,186	2.0	770,468	7,380	5,904	2.6	915,811
Chlorate and perchlorate	36.0	6,268	2,382	.9	459,584	6,696	2,411	1.1	495,741
Chromate and bichromate	40.0	4	2	------	1,449	3	1	------	906
Cyanide	70.0	52	36	------	36,350	170	119	.1	70,077
Ferricyanide (red prussiate)	42.0	83	35	------	46,203	52	22	------	28,439
Ferrocyanide (yellow prussiate)	44.0	69	30	------	18,207	80	35	------	21,181
Iodide	28.0	(2)	(2)	------	75	------	------	------	------
Nitrate (saltpeter), crude	40.0	10,546	4,218	1.6	526,573	4,826	1,930	.9	228,029
Nitrate (saltpeter), refined	46.0	5,073	2,334	.9	460,619	4,215	1,939	.9	347,290
Permanganate	29.0	118	34	------	20,852	160	46	------	26,931
Rochelle salt	22.0	135	30	------	31,255	115	25	------	27,192
All other	50.0	89	45	------	19,876	122	61	------	35,970
		47,941	20,580	7.7	4,796,711	43,248	19,155	8.5	5,191,195
Grand total	------	907,363	266,280	100.0	18,431,865	730,597	224,973	100.0	18,369,805

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[1] The figures in this table were compiled by J. A. Dorsey from the records of the Bureau of Foreign and Domestic Commerce by recalculation from pounds to short tons and to actual potash (K_2O) and by giving the totals for calendar years instead of fiscal years. The tons are calculated to the nearest even unit, and the values are those given in the original records, so that the value given for a high-priced commodity received in small quantity may not be strictly applicable to the quantity given in tons. Furthermore, the values are those placed on the commodities by the shippers and represent the values at point of shipment and do not agree with the market quotations in this country.

[2] Quantity of iodide imported was 10 pounds.

In 1913—the last normal year before the war—when the total supply was imported, the United States imported 272,457 short tons of K_2O; in 1927 the imports were 224,973 tons, or 83 per cent of that amount, and 16 per cent less than the imports in 1926. The imports in 1927 were five times the production of the United States. The combined imports and domestic production in 1927 were 1 per cent less than the imports in 1913.

Potash (K_2O) content of potash-bearing materials imported for consumption in the United States, 1918–1927, in short tons

1918	7,957	1923	209,950
1919	39,619	1924	200,365
1920	224,792	1925	258,217
1921	78,698	1926	266,280
1922	201,415	1927	224,973

The following table indicates the amount of potash-bearing materials imported in 1927 and the countries from which last shipment was made. Germany and France supplied virtually all of the crude salts and much the larger part of the refined salts imported.

Potash materials imported into the United States in 1927, in short tons[1]

[General imports. The figures in parentheses in the column headings indicate the estimated percentage of contained K_2O]

Country	Muriate (chloride) (50)	Sulphate (48.6)	Manure salts (20)	Kainite (12.4)	Bitartrate		Caustic (80)	Carbonate (61)	Cyanide (70)	Nitrate (saltpeter), crude (40)	Chlorate and perchlorate (36)	All other (50)	Total	
					Argols or wine lees (20)	Cream of tartar (25)							Short tons	Value
Algeria and Tunisia					562								562	$117,348
Argentina					988								988	102,719
Belgium	42,213	5,948	99,393	20,875					2		103	24	168,558	2,942,900
Canada	1,839	142			29	(2)		5					2,015	71,939
Chile					116					4,460	(2)		4,576	225,597
China								(2)					(2)	31
Czechoslovakia							39	396				102	537	57,783
France	18,915	1,818	10,762	12,778	6,785	90		11	3	66	95	845	52,168	2,264,458
Germany	108,632	66,815	195,579	80,708	(2)		7,080	5,037	135	144	6,417	3,810	474,357	11,005,425
Greece					661								661	115,387
Hong Kong	1	1						4	1				7	1,440
India (British)										56			56	4,491
Italy					1,408	46						2	1,456	231,766
Japan								(2)					(2)	31
Morocco					184								184	35,152
Netherlands	2,594	2,448	5,624	984				1,143	(2)	100		85	12,978	407,075
Poland and Danzig												6	6	1,367
Portugal					773								773	146,456
Spain	9,281				886								10,167	513,025
Sweden							262				3		265	59,419
Switzerland					55						78	2	135	20,944
United Kingdom					6	9	(2)		29			32	76	29,299
	183,475	77,172	311,358	115,345	12,453	145	7,381	6,596	170	4,826	6,696	4,908	730,525	18,354,052
Content of potash (K_2O)	91,738	37,506	62,272	14,303	2,491	36	5,905	4,024	119	1,930	2,411	2,454	225,189	

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[1] The figures in this table were compiled by J. A. Dorsey from the records of the Bureau of Foreign and Domestic Commerce by recalculation to short tons and to the actual potash (K_2O) and by giving the totals by the calendar year instead of the fiscal year. The tons are calculated to the nearest even unit. The data represent general imports and include both imports for immediate consumption and those going to warehouses, which may or may not be entered for consumption during the year. They differ slightly from the figures in the preceding table of imports, which represents imports for consumption.

[2] Less than 1 ton.

Potassium salts exported from the United States, 1926–27

Salt	1926		1927	
	Gross weight (short tons)	Value	Gross weight (short tons)	Value
Potassium bichromate	64	$10,308	1,965	$487,726
All other potassium salts	1,615	308,893		
	1,679	319,201	1,965	487,726

CONSUMPTION

The consumption of potash in the United States in 1927, as indicated by the imports plus the sales of domestic products, was 825,319 short tons of material containing 274,473 tons of K_2O, valued at $20,817,951. This is a decrease of 6 per cent in quantity of K_2O but an increase of 7 per cent in value, as compared with 1926. Of these totals 11 per cent of the material containing 18 per cent of the K_2O and representing 12 per cent of the total value was produced in this country. About 95 per cent of the total supply was used in the manufacture of fertilizers.

MARKET CONDITIONS

Market conditions showed little change from those of the preceding year. As cotton, tobacco, and "truck" are the chief potash-consuming crops, the States east of Mississippi River and south of Ohio River and the Mason and Dixon line are the chief users of potash, although in the Northeastern States potash is used for growing potatoes and other vegetables. The prices at which foreign potash has been available have continued to curb American production and particularly to discourage the launching of new enterprises.

PRICES

In May, 1927, the N. V. Potash Export Co., Amsterdam, Holland, opened offices in New York City as a joint selling organization for the German and French potash producers, succeeding the Potash Importing Corporation of America and the United States Bureau of the Société Commerciale de Potasses d'Alsace which had represented, respectively, the German and French potash-producing interests. No changes were made during 1927 in the schedule of prices, but, effective May 20 to December 1, inclusive, the quantity-discount plan was replaced by a system of discounts based on time of shipment. The prices per ton ruling at the end of 1925, 1926, and 1927 for the different grades of salts were as follows:

Prices of different grades of potassium salts at end of year, 1925–1927

		1925	1926 and 1927
Sulphate, 90 to 95 per cent	in bags	$45.85	$47.30
	in bulk	44.60	45.70
Muriate, 80 to 85 per cent	in bags	34.90	36.40
	in bulk	33.65	34.80
Potash-magnesia sulphate (double manure salts), 48 per cent	in bags	26.35	27.25
	in bulk	25.10	25.65
Manure salts, 30 per cent	in bags	20.00	21.75
	in bulk	18.00	18.75
Manure salts, 20 per cent	in bags	13.35	15.40
	in bulk	11.35	12.40
Kainite, 14 to 16 per cent	in bags	10.50	12.50
	in bulk	8.50	9.50
Kainite, 12.4 per cent	in bags	10.00	12.00
	in bulk	8.00	9.00

All quotations were made c. i. f. eastern United States ports. The guarantees against sellers' decline until April, 1927, and the stipulations governing discounts, settlements, etc., in effect until this time were, according to the Oil, Paint and Drug Reporter, April 26, 1926, as follows: The usual discounts, based on tons of actual potash (K_2O), ranging from 5 per cent on purchases of 50 tons to 10 per cent on purchases of 500 tons and over, and summer discounts of 4 per cent, and 2 per cent on net prices on orders for shipments delivered between May 1 and September 1 were offered during the year. Besides these discounts an additional inducement for orders for May to September shipment was made in the form of an additional rebate which gave a differential in price of at least 3 per cent less than the average monthly price of the corresponding grade shipped from October, 1926, to April, 1927, inclusive, this differential to be based on the average list price, less quantity discount, during the two periods May to September and October to April, the rebate to be computed separately on each grade of potassium salt, and the average differential rebate due buyers to be paid not later than May 31, 1927. On potash ordered for delivery ex-store an extra charge of $1.60 per short ton gross weight is added, this charge being net and providing delivery f. o. b. cars, place of shipment. From May 20 to December 1, inclusive, according to the Oil, Paint and Drug Reporter, May 23, 1927, prices were based on a minimum of 50 tons in bags or 200 tons in bulk. All bagged salts are sold on foreign weights and analyses, and bulk salts are sold on American weights and foreign analyses. Discounts were allowed on orders prior to June 5 of 8 per cent on prompt shipments, and 7 per cent on equal monthly shipments, June to September, inclusive. Orders before the first of the month for shipment during the month received discounts of 7 per cent for July, 6 per cent for August, 5 per cent for September, 4 per cent for October, 3 per cent for November, and 2 per cent for December. No discounts were made on orders after December 1, and the price list was guaranteed against sellers' decline in prices in the United States until April 30, 1928 (Oil, Paint and Drug Reporter, November 14, 1927). For unsold material afloat ordered for delivery after January 1, 1928, there was an extra charge of 50 cents per ton net weight, ex vessel. On ex-store deliveries there was the usual extra charge of $1.25 a ton for delivery f. o. b. point of shipment.

SUMMARY OF WORLD PRODUCTION

The following table, compiled by L. M. Jones, of the Bureau of Mines, lists the countries that in the last five years have produced potassium salts, and gives the available figures for their production of crude salts and K_2O content. The list of countries differs somewhat from that given in the table of imports, because in that table some of the countries from which the imports came were not themselves producers but received their supply from other countries. Both tables, however, clearly show the predominance of Germany and Alsace as producers of potash.

World's production of potash minerals and content of K_2O, 1923–1927, in metric tons

Country and mineral	1923		1924		1925		1926		1927	
	Output	K_2O content	Output	K_2O content	Output	K_2O content	Output	K_2O content	Output	K_2O content
Australia: New South Wales, alunite	1,014	82	1,024	89	540	45	589	(1)	(1)	(1)
China [2]	479	(1)	587	(1)	336	(1)	(1)	(1)	(1)	(1)
Ethiopia, crude salts	--------	--------	--------	--------	--------	--------	1,635	(1)	(1)	(1)
France (Alsace), crude salts	1,577,512	[3] 262,170	1,664,605	[3] 271,625	1,926,346	[3] 311,892	2,317,675	[3] 366,670	2,231,775	[3] 372,049
Germany, crude salts	11,348,424	[3] 1,059,700	8,091,117	[3] 895,600	12,029,576	1,574,839	9,408,109	1,262,589	11,071,541	1,518,037
India (British), nitrate of potash	8,856	3,542	8,680	3,472	[2] 6,450	2,580	[2] 100,416	(1)	(1)	(1)
Italy:										
Alunite	135	(1)	852	(1)	1,500	(1)	1,600	(1)	800	(1)
Leucite rock	8,728	(1)	15,600	1,264	226,000	18,000	35,000	2,800	56,000	4,500
Japan, alunite	19,255	(1)	10	(1)	113	(1)	(1)	(1)	(1)	(1)
Poland:										
Kainite	22,128	29,404	23,545	2,355	62,823	6,282	79,166	31,910	128,822	43,825
Sylvinite	39,375		57,875	15,626	115,980	31,315	128,523		148,271	
Russia, carbonate of potash	1,950	(1)	2,803	(1)	3,967	(1)	3,136	(1)	(1)	(1)
Spain:										
Crude salts	--------	--------	--------	--------	27,734	4,021	80,598	11,687	(1)	(1)
Potassic earth	3,000	75	1,000	29	1,000	29	950	(1)	(1)	(1)
United States, crude salts	35,406	18,339	39,675	20,777	46,779	23,086	42,024	21,197	69,689	39,471

[1] Data not available.
[2] Exports.
[3] Figures relate to merchantable products.

SILICA[1]

INTRODUCTION

Silica (SiO_2) occurs in deposits of commercial importance in many different forms, such as vein quartz, as a constituent of pegmatites, as sand, sandstone, quartzite, or flint, as tripoli, and as diatomite or diatomaceous earth. In some forms, such as rose, smoky, and amethystine quartz, it has value as gems. This chapter deals with silica of all kinds except gem quartz, silica sand or sandstone used for making glass, and silica used in the form of sand, gravel, and crushed material for building, for concrete and mortar, for foundry and furnace work, and for cutting and grinding stone. Such material as is not here included is either gem material or sand, is commercially so designated, and is therefore considered in other chapters of Mineral Resources. Tripoli and diatomite were, in the past, largely consumed as abrasives and are considered in the chapter on abrasive materials.

For a comprehensive discussion of the occurrence, mining or quarrying, methods of preparation, and uses of the various forms of silica the reader is referred to a recent report by W. M. Weigel entitled "Technology and Uses of Silica and Sand," Bulletin 266, Bureau of Mines, 1927, which may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 40 cents the copy.

PRODUCTION

The production of quartz (crude and ground) from pegmatite dikes, from veins, and from quartzite decreased 20 per cent in quantity and 29 per cent in value in 1927, as compared with 1926. Ground sand and sandstone increased 2 per cent in quantity but decreased 1.6 per cent in value. Tripoli decreased 17 per cent in quantity and 15 per cent in value.

Silica sold or used by producers in the United States for pottery, paints, fillers, polishers, abrasives, and other uses, 1925–1927

Material	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Quartz (vein quartz, pegmatite, and quartzite)	25,444	$205,376	27,743	$274,333	22,144	$194,040
Sand and sandstone [a]	263,981	1,857,263	270,468	1,928,793	275,737	1,897,303
Tripoli (including rottenstone) (ground and otherwise prepared)	29,388	434,886	31,369	523,609	26,099	447,068
Diatomite	73,030	922,281	87,126	1,081,564	(b)	(b)
	391,843	3,419,806	416,706	3,808,299	(b)	(b)

[a] Includes only finely ground material. Figures probably incomplete.
[b] Bureau of Mines not at liberty to publish figures.

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[1] Statistics on production were prepared by Estelle R. Phillips, of the Bureau of Mines. Figures on imports were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

QUARTZ

The States from which production of quartz (from pegmatite dikes, from veins, and from quartzite) was reported in 1927 were California, Maine, Maryland, Massachusetts, Nevada, New Hampshire, New York, North Carolina, Pennsylvania, Virginia, Washington, and Wisconsin. California reported the largest production, with Maryland and North Carolina next in order. The mining of some vein or pegmatite quartz for fusing to quartz glass and of optical quartz—quartz crystals—was reported.

The total quantity of crude, crushed, and ground quartz sold or used by producers in 1927 amounted to 22,144 short tons, valued at $194,040. This output consisted of 13,440 tons of crude quartz, valued at $68,122, 5,064 tons of crushed quartz, valued at $55,899, and 3,640 tons of ground quartz, valued at $70,019.

Some of the crude material included in the foregoing figures was purchased by grinders who reported an additional production of 11,569 tons of ground quartz, valued at $262,283. This output of ground quartz, with the 3,640 tons reported by the original producers of the crude, made a total of 15,209 tons of ground quartz, valued at $332,302.

Average values f. o. b. mines for the crude quartz reported by individual producers ranged from $2.68 to $7.50 a short ton, with an average sales value of $5.07 for the total quantity reported for the country. Corresponding values for crushed quartz ranged from $5.50 to $13.62, and averaged $11.04 a ton for the total output.

Average values of the ground quartz reported by individual producers ranged widely, as usual, from about $5.50 to $46.42 a ton. The average sales value of all ground quartz here considered was $21.85 a ton. In 1927 production was reported by the following manufacturers of ground quartz, some of whom use it in the manufacture of other products:

American Encaustic Tiling Co. (Ltd.), 2030 East Fifty-second Street, Los Angeles, Calif.
Baeder-Adamson Co., Philadelphia, Pa.
Herman Behr & Co., 23–63 Tiffany Place, Brooklyn, N. Y.
Erwin Feldspar Co. (Inc.), Erwin, Tenn.
Eureka Flint & Spar Co., Trenton, N. J.
Flynt Silica & Spar Co., 1047 Richmond Street, Los Angeles, Calif.
Lithowhite Silex Co., New Milford, Conn. (Ceased operations June, 1927.)
Martin Minerals Co., 1901 East Slausen Avenue, Los Angeles, Calif.
Maryland Quartz Co., 73 Munsey Building, Baltimore, Md.
Oliver Quartz Co., Charlotte, N. C.
Spicky Polish Corporation, 214 Front Street, San Francisco, Calif.
Standard Flint & Spar Corporation, Trenton, N. J.
Standard Sanitary Manufacturing Co., Box W, Richmond, Calif.
Trenton Flint & Spar Co., Trenton, N. J.
United States Sandpaper Co., Williamsport, Pa.

Other companies which reported "crushed" (not "ground") material in 1927 were as follows:

The Enos Adams Co., Bennington, Vt. (mill at Adams, Mass.).
Apex Engineering Co., 609 Rookery Building, Spokane, Wash.
Cheshire White Quartz Sand Co., Cheshire, Mass.
San Jacinto Rock Products Co., San Jacinto, Calif.
Wausau Abrasives Co., P. O. Box 436, Wausau, Wis.

Quartz sold or used by producers in the United States, 1918–1927

Year	Crude		Ground[1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	61,008	$121,888	10,732	$137,442	71,740	$259,330
1919	51,774	135,187	11,558	238,384	63,332	373,571
1920	59,423	142,397	8,767	177,953	68,190	320,350
1921	8,570	39,660	2,682	45,297	11,252	84,957
1922	5,085	23,093	5,568	78,254	10,653	101,347
1923	14,159	66,723	6,442	126,907	20,601	193,630
1924	20,570	123,099	3,191	80,078	23,761	203,177
1925	22,312	143,861	3,132	61,515	25,444	205,376
1926	22,230	159,052	5,513	115,281	27,743	274,333
1927	18,504	124,021	3,640	70,019	22,144	194,040

[1] In order to avoid duplication, the ground material shown here is only that ground by the original producers of the crude quartz or by grinders who purchase from small miners not reporting their production.

Quartz (crude, crushed, and ground [1]) sold or used by producers in the United States, 1926–27, by States

State	1926		1927	
	Short tons	Value	Short tons	Value
California	8,902	$103,016	6,755	$61,802
Connecticut	246	1,678		
Maine	328	1,050	(2)	(2)
Maryland	4,681	47,507	4,409	37,717
Nevada	2,292	12,125	1,030	6,180
New Hampshire	277	1,053	(2)	(2)
New York	2,135	13,121	520	2,597
North Carolina	2,134	17,457	3,396	19,853
Washington	(2)	(2)	273	2,070
Undistributed[3]	6,748	77,326	5,761	63,821
	27,743	274,333	22,144	194,040

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[1] In order to avoid duplication, the ground material included is only that ground by the original producers of the crude quartz or by grinders who purchase from small miners not reporting their production.

[2] Included under "Undistributed."

[3] 1926: Massachusetts, Pennsylvania, Virginia, Washington, and Wisconsin; 1927: Maine, Massachusetts, New Hampshire, Pennsylvania, Virginia, and Wisconsin.

GROUND SAND AND SANDSTONE

Ground sand and sandstone amounting to 275,737 short tons, valued at $1,897,303, was sold or used in 1927 by producers in Illinois, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin.

Values ranged from $3.75 to $17.74 per ton. This wide range is due in part to differences in purity, fineness, and perfection of sizing. Thus the average value of $6.88 per ton indicated by the total quantity and value of production is of little significance.

The following producers reported ground sand or sandstone in 1927:

Central Silica Co., Glass Rock, Ohio.
Clinch Mountain Silica Sand Corporation, Box 476, Richmond, Va.
Eureka Flint & Spar Co., Trenton, N. J.
Golding Sons Co., Trenton, N. J.
Michigan Quartz Silica Co., Milwaukee, Wis.
National Pulverizing Co., Millville, N. J.
National Silica Co., Oregon, Ill.
National Silica Works, Berkeley Springs, W. Va.
New Jersey Pulverizing Co., 15 Park Row, New York, N. Y.

Ottawa Silica Co., Ottawa, Ill.
Pennsylvania Glass Sand Co. (grinds in New Jersey, Pennsylvania, and West Virginia), Lewistown, Pa.
Pioneer Silica Products Co., Pacific, Mo.
Potters Mining & Milling Co., East Liverpool, Ohio.
Standard Flint & Spar Corporation, Trenton, N. J.
Trenton Flint & Spar Co., Trenton, N. J.
Wedron Silica Co., First National Bank Building, Chicago, Ill.

Ground sand and sandstone sold or used by producers in the United States, 1918–1927 [1]

Year	Short tons	Value	Year	Short tons	Value
1918	98,956	$620,584	1923	249,467	$1,672,961
1919	47,277	288,890	1924	230,432	1,655,056
1920	158,395	1,183,014	1925	263,981	1,857,263
1921	105,887	802,450	1926	270,468	1,928,793
1922	163,295	1,061,057	1927	275,737	1,897,303

[1] Includes only finely ground material. Figures probably incomplete.

Ground sand and sandstone sold or used by producers in the United States, 1926–27, by States [1]

	1926		1927	
	Short tons	Value	Short tons	Value
Illinois and Missouri	88,211	$549,058	84,925	$476,007
New Jersey	65,001	299,349	86,361	460,347
Virginia and West Virginia	51,375	450,989	54,335	481,434
Ohio, Pennsylvania, and Wisconsin	65,881	629,397	50,116	479,515
	270,468	1,928,793	275,737	1,897,303

[1] Includes only finely ground material. Figures probably incomplete.

IMPORTS

Data on imports of silica materials are found in the records of the Bureau of Foreign and Domestic Commerce under the classifications "silica, crude," "silica, for use as pigment," and "flint, flints, and flint stones, unground." Imports of crude silica were reported for 1927 from the Philippine Islands, and amounted to 12 short tons, valued at $175. Imports of crude silica reported for 1926 were 27 short tons, valued at $149; for 1925, 22 tons, valued at $486. Imports of silica for use as pigment amounted to 22 short tons, valued at $535, in 1927; none were separately recorded for 1926 or 1925. The imports of "flint, flints, and flint stones, unground," are flint pebbles for grinding mills and for other uses such as are listed in this report; they amounted to 15,191 short tons, valued at $93,658, in 1927, as compared with 15,091 tons, valued at $120,078, in 1926, and 16,240 tons, valued at $105,041, in 1925.

France, as usual, was the source of most of the imports of "flint, flints, and flint stones, unground," in 1927, furnishing 72 per cent of the total quantity. Except for a single ton from Sweden, the balance came from Denmark and Belgium.

The values assigned to the imports considered in the following tables are those upon which the import duties in the United States are levied and represent the foreign market value (or the export value, if higher) plus cost of containers and all expenses incident to placing merchandise ready for shipment to the United States, including export tax, if any.

"Flint, flints, and flint stones, unground," imported for consumption in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	(1)	$127,808	1923	15,952	$130,974
1919	19,798	250,096	1924	17,473	114,958
1920	26,636	338,630	1925	16,240	105,041
1921	10,084	116,157	1926	15,091	120,078
1922	16,040	145,805	1927	15,191	93,658

[1] Quantity not recorded prior to July, 1918. During last 6 months of 1918 the imports were 5,224 tons, valued at $55,440.

"Flint, flints, and flint stones, unground," imported into the United States, 1925–1927, by countries

Country	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Algeria and Tunisia			104	$477		
Belgium	1,463	$23,547	1,680	24,924	1,089	$14,513
Canada			3	23		
Denmark	2,284	21,494	3,454	39,120	3,148	24,812
France	12,309	59,247	9,475	52,522	10,953	54,307
Germany	1	16				
Japan	32	358				
Sweden					1	26
United Kingdom	(1)	6	375	3,012		
West Indies—British	151	373				
	16,240	105,041	15,091	120,078	15,191	93,658

[1] Less than 1 ton.

FELDSPAR

By Jefferson Middleton

INTRODUCTION

In the following discussion the figures for quantity and value of feldspar sold or used by producers in the United States are presented as the best available measure of output.

During 1927 the feldspar industry, judging by the volume and value of business done, retrogressed slightly. The total production of crude feldspar was 202,497 long tons, valued at $1,424,755, a decrease of 4 per cent in quantity and 11 per cent in value compared with 1926.

Keen competition in the feldspar milling industry, caused by the increased number and capacity of mills in the past few years, has resulted in a lower price to the consumer; the lower production costs made necessary by the lower selling price and the demand for a better product are believed to have been effected in the modern mills erected in various parts of the country. The large grinding capacity of the mills of the country and the large supplies of crude spar make the development of new uses for feldspar most desirable; this aspect of the industry should engage the attention of producers if the industry is to expand or even utilize its present possibilities.

The imports of crude feldspar decreased 2,517 long tons, or 8 per cent, and the value decreased $45,040, or 18 per cent. The apparent consumption (production plus imports) of crude feldspar in the United States in 1927 was 229,921 long tons; 88 per cent of this total was domestic material. Production and consumption of ground spar are practically identical, imports and exports being negligible, and 87 per cent of the ground feldspar consumed in 1927 was prepared from domestic crude feldspar.

The second progress report of the Bureau of Standards on its study of the physical properties of feldspar with reference to their behavior in pottery bodies and glazes, by R. F. Geller, was published in the Journal of the American Ceramic Society, volume 10, No. 6, June, 1927, and contains much of interest to the producers and users of feldspar. Another paper prepared in the Bureau of Standards on the quantitative microscopic analysis of commercial feldspar, by Herbert Insley, read before the February, 1927, meeting of the American Ceramic Society and published in its journal, volume 10, No. 9, September, 1927, is also an important contribution to the literature of the subject.

A paper on some feldspathic materials of the Pacific Northwest, by Hewitt Wilson, was published in 1927 by the Bureau of Mines as Reports of Investigations, Serial 2794, and discusses the local supply of feldspathic material usable in the ceramic industries when they shall develop in that region.

PRODUCTION

Statistics of production of feldspar are presented separately for crude feldspar or mine and quarry output and for ground feldspar or mill output. The crude feldspar is reported in long tons of 2,240 pounds and the ground feldspar in short tons of 2,000 pounds, according to the common practice in the industry. The average value of crude feldspar in 1927 at the mine or shipping point nearest thereto was $7.04 a long ton, or 61 cents lower than that of 1926. In 1927 the average value of ground domestic feldspar was $15.13 a short ton, or $1.16 lower than that of 1926, and that of imported spar ground in the United States was 87 cents higher than that of 1926. The average values of crude spar as reported by individual producers ranged from $2.22 to $12.26 a long ton. For New England the range was from $4.50 to $12.26; for Maryland, New York, Pennsylvania, and Virginia, from $2.22 to $10.08; for North Carolina, from $4.25 to $7.31; and for Arizona, California, Colorado, and South Dakota, from $3 to $10.80.

The quantity and value of crude and ground feldspar decreased only slightly as compared with the record-breaking output of 1926. The output of crude spar in 1927 was exceeded only by that of 1924 and 1926. The decrease was 4 per cent in quantity and 11 per cent in value, compared with 1926; compared with 1924 the decrease in 1927 was 1 per cent in quantity and 6 per cent in value. The average value of crude spar per ton in 1927 was 61 cents less than that of 1926 and 33 cents less than that of 1924.

CRUDE FELDSPAR

In 1927 crude feldspar was reported from the same 12 States as in 1926. Maine and North Carolina were the only important producing States to show an increase in quantity compared with 1926, and Colorado, North Carolina, and Pennsylvania were the only States to show an increase in value.

Crude feldspar sold or used by producers in the United States, 1918–1927

Year	Long tons	Value		Year	Long tons	Value	
		Total	Average			Total	Average
1918	88,498	$429,989	$4.86	1923	145,004	$1,057,595	$7.29
1919	63,441	347,992	5.49	1924	204,772	1,509,339	7.37
1920	135,551	851,123	6.28	1925	185,706	1,315,654	7.08
1921	91,865	617,652	6.72	1926	209,989	1,607,101	7.65
1922	117,127	844,568	7.21	1927	202,497	1,424,755	7.04

Crude feldspar sold or used by producers in the United States, 1922–1927, by States

[Value is at mine or nearest shipping point]

State	1922		1923		1924	
	Long tons	Value	Long tons	Value	Long tons	Value
Arizona	---------	---------	(1)	(1)	(1)	(1)
California	2, 378	$17, 510	9, 297	$62, 499	8, 027	$62, 344
Colorado	104	580	(1)	(1)	(1)	(1)
Connecticut	7, 499	47, 887	8, 780	75, 379	6, 572	51, 422
Maine	21, 692	221, 478	25, 029	230, 122	29, 912	271, 354
Maryland	2, 899	18, 099	2, 750	17, 010	4, 854	25, 020
New Hampshire	14, 017	116, 751	23, 220	171, 789	39, 425	324, 638
New York	(1)	(1)	15, 161	127, 477	13, 839	108, 751
North Carolina	56, 043	333, 745	57, 622	360, 636	97, 075	640, 403
Pennsylvania	(1)	(1)	2, 069	6, 355	1, 481	4, 763
South Dakota	---------	---------	---------	---------	(1)	(1)
Virginia	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed	12, 495	88, 518	1, 076	6, 328	3, 587	20, 644
	117, 127	844, 568	145, 004	1, 057, 595	204, 772	1, 509, 339

State	1925		1926		1927	
	Long tons	Value	Long tons	Value	Long tons	Value
Arizona	(1)	(1)	(1)	(1)	(1)	(1)
California	6, 077	$49, 881	6, 271	$49, 300	5, 260	$43, 329
Colorado	(1)	(1)	(1)	(1)	(1)	(1)
Connecticut	10, 426	71, 201	11, 436	87, 844	6, 123	43, 319
Maine	28, 404	256, 731	33, 897	306, 695	34, 328	299, 386
Maryland	4, 554	26, 438	(1)	(1)	2, 001	11, 612
New Hampshire	38, 366	278, 736	33, 271	287, 596	27, 419	223, 077
New York	10, 474	70, 446	15, 517	157, 865	12, 020	96, 446
North Carolina	76, 806	496, 563	91, 433	602, 020	100, 756	612. 214
Pennsylvania	1, 330	4, 722	1, 484	4, 492	3, 938	24, 257
South Dakota	(1)	(1)	(1)	(1)	(1)	(1)
Virginia	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed	9, 269	60, 936	16, 680	111, 289	10, 622	71, 115
	185, 706	1, 315, 654	209, 989	1, 607, 101	202, 497	1, 424, 755

[1] Included under "Undistributed."

GROUND FELDSPAR

Probably all the feldspar consumed industrially, except that used for facing cement work, for covering prepared roofing, for "chicken grits," and like purposes, is prepared by fine grinding. Even for such uses the spar is at least crushed to small sizes and more or less graded by screening, but it has not been possible to canvass all users of feldspar to determine the amounts ground and used by them. All known merchant mills or grinders—that is, those who quarry or purchase crude spar and grind it for sale to other establishments—have been canvassed for statistics of ground feldspar during the last six years.

In 1927, 30 operators running 32 mills in 13 States reported 223,915 short tons of ground feldspar, an increase of one each in the number of operators and mills, compared with 1926. Of these mills 26 worked exclusively on domestic feldspar, 4 exclusively on imported spar, and 2 on both domestic and imported spar. Of the total quantity 87 per cent (194,672 tons) was from domestic feldspar and 13 per cent (29,243 tons) was from imported spar, a gain in favor of imported spar. For the first time for some years Cornwall stone was reported as having been ground in a domestic mill.

In 1927 the average value per ton of ground feldspar from domestic crude was $15.13, a decrease of $1.16 compared with 1926; from imported crude it was $21.13, an increase of 87 cents. Direct comparisons of values are misleading, however, as the figures for imported spar generally relate to high-grade material at mills near points of consumption, whereas the figures for domestic spar cover all grades at various points, many of which are distant from consuming centers. Tennessee is the leading producer of ground feldspar from domestic crude, reporting more than one-fourth of the total for 1927; Maine was second in 1927, with 15 per cent of the total; North Carolina was third, displacing New Jersey. New York reported 78 per cent of the feldspar ground in this country from imported crude in 1927. The average value per ton of ground feldspar from domestic crude ranged from $10.63 to $22.

Ground feldspar sold by merchant mills[1] in the United States, 1922–1927

Year	Number of operators	Domestic			Canadian[2]			Total		
		Short tons	Value		Short tons	Value		Short tons	Value	
			Total	Average		Total	Average		Total	Average
1922	20	107,969	$1,790,305	$16.58	19,075	$364,082	$19.09	127,044	$2,154,387	$16.96
1923	26	151,855	2,486,810	16.38	25,374	486,546	19.17	177,229	2,973,356	16.78
1924	30	163,905	2,760,286	16.84	25,875	522,884	20.21	189,780	3,283,170	17.30
1925	33	184,816	3,017,845	16.33	28,042	586,000	20.90	212,858	3,603,845	16.93
1926	29	199,215	3,246,174	16.29	26,147	529,623	20.26	225,362	3,775,797	16.75
1927	30	194,672	2,946,154	15.13	[2] 29,243	[2] 617,987	21.13	223,915	3,564,141	15.92

[1] Does not include potters and others who grind for consumption in their own plants.
[2] Figures for 1927 include some Cornwall stone.

Ground feldspar sold by merchant mills[1] in the United States, 1926–27, by States

State	1926					1927				
	Number of operators	Domestic		Canadian		Number of operators	Domestic		Canadian[2]	
		Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
California	4	10,899	$218,589			3	11,625	$201,511		
Maine	4	32,076	587,406			4	29,197	533,774		
New Jersey	3	28,430	550,195	(3)	(3)	4	25,344	485,446		
New York	4	(3)	(3)	23,533	$473,686	4	(3)	(3)	22,863	$465,944
Ohio	3	(3)	(3)	(3)	(3)	3	(3)	(3)	[2] 6,380	[2] 152,043
North Carolina	1	76,891	978,477			2	80,563	970,323		
Tennessee	3					3				
Undistributed[4]	7	50,919	911,507	2,614	55,937	7	47,943	755,100		
	29	199,215	3,246,174	26,147	529,623	30	194,672	2,946,154	29,243	617,987

[1] Does not include potters or others who grind for consumption in their own plants.
[2] Figures include some Cornwall stone.
[3] Included under "Undistributed."
[4] 1926: Colorado, Connecticut, Illinois, Maryland, New Hampshire, New Jersey (Canadian), New York (domestic), Ohio, and Pennsylvania; 1927: Colorado, Connecticut, Illinois, Maryland, New Hampshire, New York (domestic), Ohio (domestic), and Pennsylvania.

USES

The uses of feldspar are manifold. Its principal use is as a flux in the pottery (both body and glaze), glass, and enameling industries, including tiles, porcelains, and so-called marbles that find their use in hotels, restaurants, drug stores, and other places where a vitrified surface is desired for sanitary reasons. It is also used as an abrasive in scouring soap, as a binder in the manufacture of abrasive wheels, as poultry grit, as a constituent of roofing material, and in stucco or pebble dash. Small quantities of the purest grades of potash feldspar are used in the manufacture of artificial teeth. Efforts to use feldspar as a source of supply of potash on a commercial scale continue, but claims of success remain unestablished.

INDUSTRY BY STATES

In 1927 the production of crude feldspar was reported from the same 12 States as in 1926; in the order of quantity of output, these States are: North Carolina, Maine, New Hampshire, New York, Connecticut, California, Virginia, Pennsylvania, South Dakota, Colorado, Maryland, and Arizona. The first seven and South Dakota (ninth) held the same relative rank in 1926 and 1927. The first seven States reported 94 per cent of the total output in both 1926 and 1927. The other States, of minor importance, varied slightly in relative rank. Feldspar was ground in commercial mills in each of the producing States except Arizona, South Dakota, and Virginia. In addition, mills grinding feldspar were operated in Illinois, New Jersey, Ohio, and Tennessee. In California, New Jersey, New York, and Ohio the mills are at or near the centers of consumption; in most of the other States they are near the points of production.

Arizona.—The deposit of feldspar near Kingman, Mohave County, was operated during 1927 by the Gold Cliff Central Mining Co., Kingman. The material is used in California in the ceramic industries. In 1927 Arizona ranked twelfth in quantity and tenth in value of crude feldspar.

California.—Six operators, in Calaveras, Kern, Riverside, and San Diego Counties, reported production of crude feldspar in 1927; the output decreased 16 per cent in quantity and 12 per cent in value compared with 1926. The quantity of ground spar increased 7 per cent but its value decreased 8 per cent, compared with 1926. California ranked sixth in quantity of crude and ground spar and fifth in the value of these materials. A considerable part of the crude spar consumed in California in 1927 came from Arizona.

Colorado.—In 1927 the quantity and value of both crude and ground spar in Colorado increased compared with 1926. Colorado ranked tenth in the quantity and twelfth in value of crude feldspar in 1927, and twelfth in both quantity and value of ground spar.

Connecticut.—Connecticut ranked fifth in the quantity and sixth in the value of crude feldspar in 1927, nine operators reporting sales. The quantity of crude spar sold or ground by the producer decreased 46 per cent and the value 51 per cent compared with 1926. The spar produced by L. W. Howe and the Tidewater Feldspar Co. was ground in mills operated by these producers. The output of the other quarries was shipped to mills at Trenton, N. J., and East Liverpool, Ohio, where it was ground for ceramic use.

Illinois.—The mill at Murphysboro operated by the Isco-Bautz Co. (Inc.) continued running on feldspar from South Dakota.

Maine.—In 1927, as in 1926, Maine ranked second among the States in the quantity and value of both crude and ground feldspar. The quantity of crude spar reported increased 1 per cent, but the value decreased 2 per cent compared with 1926. The quantity and value of ground spar both decreased 9 per cent compared with 1926. In 1927 Maine reported 17 per cent of the total output of crude feldspar and 21 per cent of the total value. Androscoggin, Oxford, and Sagadahoc were the producing counties. Most of the spar mined in Maine is ground in mills in the State; these mills are operated by the J. W. Cummings Feldspar Co., the Maine Feldspar Co. (the largest grinder and also the largest producer of crude spar in the State), the Oxford Mining & Milling Co., and the Trenton Flint & Spar Co.

Maryland.—In 1927 the output of crude feldspar declined compared with 1926, and the State was eleventh in quantity and value of crude spar and ninth in quantity and value of ground spar. The one grinder in the State, the Clinchfield Sand & Feldspar Corporation, of Baltimore, obtained its crude spar from the quarries of the State and from Virginia. Shipments of ground Virginia spar from this mill were reported to have been made to France in 1927.

New Hampshire.—In 1927 New Hampshire ranked third in quantity and value of crude feldspar, with 14 per cent of the total output and 16 per cent of the total value. The quantity produced in this State decreased 17 per cent and the value 22 per cent compared with 1926. The Eureka Flint & Spar Co. and the Golding-Keene Co. were the large producers in 1927. New Hampshire's product was used in the abrasives, ceramic, and soap industries. The Golding-Keene Co. operated the only mill in the State.

New Jersey.—New Jersey produces no crude feldspar, yet it is an important State in the industry, being a large producer of ground feldspar as well as a large consumer of that material in its pottery industry. At Trenton are the mills of the Eureka Flint & Spar Co., the Golding Sons Co., the Standard Flint & Spar Corporation, and the Trenton Flint & Spar Co. In 1927 these mills reported 13 per cent of the domestic ground spar.

New York.—In 1927 New York ranked fourth in quantity and value of crude spar and seventh in quantity and eighth in value of ground spar from domestic quarries; it is the largest grinder of Canadian spar and ranks second in the total production of ground feldspar. Its output of crude spar in 1927 came from Essex, Saratoga, St. Lawrence, and Westchester Counties, and was mined by the Crown Point Spar Co., the Adirondack Feldspar Corporation, the Green Hill Mining Co., and the Bedford Mining Co. (Inc.). There were four active grinding mills in the State. The mill of the Bedford Mining Co. (Inc.) ground only domestic spar; those of the Genesee Feldspar Co. (Inc.) and the Dominion Feldspar Corporation ground Canadian spar only; and that of the New York Feldspar Corporation ground both domestic and Canadian feldspar.

North Carolina.—In 1927 North Carolina was the largest producer of crude feldspar, as it has been for a number of years; its output was nearly three times as large as that of Maine, the second State. Sales of crude feldspar in 1927 increased 9,323 tons, or 10 per cent in quantity, and $10,194, or 2 per cent in value, compared with 1926. The quantity in 1927 was the highest ever recorded in this State and was 3,681 tons, or 4 per cent, larger than that of 1924, the previous record year. The value in 1927 was the highest recorded except that of 1924, from which it was a decrease of $28,189, or 4 per cent. The quantity sold in 1927 was nearly three times and the value nearly four times as great as in 1918. The average value per ton of the crude feldspar in 1927 was $6.08, compared with $6.58 in 1926. A considerable part of the output was made by numerous small operators who sell or barter their feldspar to some central distributing agency. Some of the larger buyers and distributors in 1927 were the Carolina Mineral Co. (Inc.), J. C. Pitman, and the Tennessee Mineral Products Co. In 1927 most of the spar (about 85 per cent of the total) was produced in Mitchell County. Feldspar was produced also in Avery and Yancey Counties. In 1927 two grinding mills were operated in North Carolina, one by the North State Feldspar Corporation and the other, a fine modern plant erected at Spruce Pine in 1927, by the Tennessee Mineral Products Co. The Golding Sons Co. has also established a grinding plant at Spruce Pine, but this plant was not operated in 1927.

Ohio.—No feldspar is produced in Ohio, but this State and adjacent territory in Pennsylvania and West Virginia produce more than one-half of the high-grade pottery made in the United States; hence the region is a large consumer of feldspar. The potteries in this region are partly supplied by the mills in Ohio, which are operated by the Golding Sons Co. and the Potters Mining & Milling Co. at East Liverpool and the Rock Products Co. at Silica, near Toledo. The Golding Sons Co. ground both domestic feldspar and Cornwall stone in 1927; the Potters Mining & Milling Co. and the Rock Products Co. ground only Canadian crude.

Pennsylvania.—In 1927 the quantity of crude feldspar produced was more than double that in 1926. The increase was caused mainly by the opening of a quarry by the Standard Flint & Spar Corporation at or near Embreeville, Chester County, for the production of high-grade feldspar to be ground in its mill at Trenton, N. J., for use in the ceramic industries. The only mill in the State was operated by the American Feldspar Co. at Toughkenamon.

South Dakota.—The output of crude feldspar in South Dakota in 1927 was reported by the Keystone Feldspar & Chemical Co., which has a quarry at Keystone, Pennington County.

Tennessee.—Tennessee is another State that is important in the domestic feldspar industry but has no feldspar quarries. Its northeastern border is near the North Carolina feldspar region, and the Clinchfield Railroad, which traverses northeastern Tennessee and southwestern North Carolina, offers the natural outlet for that region. Consequently, though grinding of feldspar was not begun there until 1914, the State now contains the largest feldspar-grinding center in the country. In 1927 there were four mills operated in the State, two by the Erwin Feldspar Co. (Inc.), one by the Golding Sons Co., and one by the Tennessee Mineral Products Co. The last two companies, however, discontinued operations in Tennessee and moved to North Carolina during the year. As most of the North Carolina feldspar has been ground in the Tennessee mills it seems appropriate to group these States to represent the output of the region. In

1927 the sales of ground feldspar from Tennessee and North Carolina mills amounted to 80,563 short tons, valued at $970,323, or 41 per cent of the total quantity and 33 per cent of the total value of domestic ground spar.

Virginia.—The Seaboard Feldspar Corporation, of Baltimore, Md., controls two quarries at Moneta, Bedford County, Va., which were active during 1927. The product is described as a high-grade potash spar used in the manufacture of ceramics. The General Minerals Corporation of Virginia reports the production of gem feldspar from quarries near Winterhaven Station, Amelia County, during 1927.

IMPORTS [1]

The foreign trade of the United States in feldspar is small and is limited largely to imports from Canada. Before the tariff act of 1922 (September 22) imports of feldspar were not specifically classified in the official records of the Bureau of Foreign and Domestic Commerce and are therefore unknown, but from that date until the end of the year 37 long tons of crushed or ground feldspar, valued at $538, was imported. No imports of crushed or ground feldspar were recorded from 1923 to 1925, but 36 long tons, valued at $1,743, was imported in 1926, and 250 pounds, valued at $3, in 1927. The following table shows the imports of crude feldspar since the change in the tariff.

Crude feldspar imported for consumption in the United States, 1922–1927

Year	Long tons	Value	
		Total	Average
1922 (Sept. 22–Dec. 31)	7,549	$60,111	$7.96
1923	24,271	184,924	7.62
1924	35,139	284,716	8.10
1925	24,994	203,524	8.14
1926	29,941	251,896	8.41
1927	27,424	206,856	7.54

FOREIGN PRODUCTION

A considerable part of the supply of feldspar annually available for use in the United States is mined in Canada. According to reports of the Dominion Bureau of Statistics, the Canadian shipments—all from Ontario and Quebec—amounted in 1927 to 25,604 long tons, valued at $250,954, or $9.80 a ton, a decrease of 20 per cent in quantity and 19 per cent in value compared with 1926.

Feldspar, produced in Canada, sold in 1918–1927

Year	Long tons	Value	Year	Long tons	Value
1918	16,770	$112,728	1923	26,094	$237,601
1919	13,106	86,231	1924	40,004	358,540
1920	33,815	280,895	1925	25,608	235,789
1921	26,668	230,754	1926	32,099	310,238
1922	24,756	248,402	1927	25,604	250,954

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[1] Figures on imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

The following table shows the most recent figures of production of feldspar in the chief producing countries. Besides the United States and Canada, Germany, Japan, Norway, Russia, and Sweden are the important producers. Although Great Britain has an immense pottery industry, it appears to be a small producer of feldspar. Cornwall stone rather than feldspar is extensively used as a flux in the British pottery industry.

Feldspar produced in principal producing countries, 1923–1927, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country [1]	1923	1924	1925	1926	1927
Australia:					
New South Wales	13	15	33	11	[2] 16
South Australia [2]	20	----------	10	105	93
Western Australia (exports)	----------	----------	----------	8	(3)
Canada	26, 512	40, 645	26, 019	32, 614	26, 015
Finland (exports)	689	681	753	738	553
France	4, 980	5, 800	3, 200	(3)	(3)
Germany (Bavaria)	8, 986	33, 138	10, 258	6, 660	7, 320
Great Britain	3, 298	1, 070	----------	----------	(3)
Italy	5, 070	5, 200	3, 400	5, 878	4, 054
Japan	22, 940	23, 427	19, 049	(3)	(3)
Norway (exports)	13, 073	20, 875	26, 785	20, 510	27, 650
Rumania	(3)	(3)	423	1, 700	1, 943
Russia [4]	441	3, 579	8, 613	18, 640	(3)
Sweden	16, 857	19, 309	26, 751	33, 970	(3)
Union of South Africa	----------	----------	----------	101	(3)
United States	147, 331	208, 059	188, 687	213, 359	205, 747

[1] In addition to the countries listed, feldspar is produced in Czechoslovakia. Figures of output are not available, but it is estimated that the annual production is approximately 30,500 metric tons.

[2] Includes some china stone.

[3] Data not available.

[4] Data for year ended Sept. 30.

ASPHALT AND RELATED BITUMENS

By G. R. Hopkins and A. B. Coons[1]

GENERAL STATEMENT

The term "asphalt" is commonly used to denote the various forms of bitumen found in nature or produced by refining. As used in this report, the term includes: (1) Native asphalt, which in the United States is generally associated with other mineral matter, such as limestone and sandstone, and is usually called bituminous rock; (2) the "related bitumens"—a series of natural hydrocarbons, of which only gilsonite, grahamite, ozokerite, and wurtzilite (elaterite) are of commercial importance; (3) petroleum asphalt, the major class, obtained in the refining of oils of an asphaltic base or a mixed asphaltic and paraffin base. Native asphalt of the "pitch lake" type is not found in the United States in sufficient quantities to compete with the celebrated Trinidad and Bermudez Lake deposits, which together supply nearly all of the asphalt imports of this country.

Asphalt sold by producers at mines or refineries in the United States, 1918–1927

[Value f. o. b. mine or refinery]

Year	Native asphalt and related bitumens		Manufactured asphalt					
			From domestic petroleum		From foreign petroleum		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1918	60, 034	$780, 808	604, 723	$8, 796, 541	597, 697	$9, 417, 818	1, 202, 420	$18, 214, 359
1919	88, 281	682, 989	614, 692	8, 727, 372	674, 876	7, 711, 510	1, 289, 568	16, 438, 882
1920	198, 497	1, 213, 908	700, 496	11, 985, 457	1, 045, 779	14, 272, 862	1, 746, 275	26, 258, 319
1921	296, 412	1, 985, 583	624, 220	9, 048, 221	908, 093	11, 761, 358	1, 532, 313	20, 809, 579
1922	327, 792	2, 253, 180	805, 145	10, 385, 925	1, 242, 163	13, 899, 407	2, 047, 308	24, 285, 332
1923	400, 236	2, 885, 631	995, 654	13, 060, 174	1, 378, 722	16, 840, 045	2, 374, 376	29, 900, 219
1924	562, 367	3, 958, 339	1, 158, 456	14, 305, 007	1, 920, 915	21, 710, 793	3, 079, 371	36, 015, 800
1925	584, 850	4, 148, 400	1, 206, 700	15, 305, 760	1, 971, 670	27, 520, 010	3, 178, 370	42, 825, 770
1926	715, 180	4, 484, 960	1, 245, 160	15, 452, 940	2, 213, 310	31, 098, 460	3, 458, 470	46, 551, 400
1927	839, 040	5, 605, 850	1, 525, 420	19, 019, 150	2, 426, 030	35, 771, 940	3, 951, 450	54, 791, 090

NATIVE ASPHALTS AND BITUMENS

Bituminous rock.—The term "bituminous rock" is used to designate all kinds of rock, whether in a friable or solid state, that contain an appreciable quantity of bitumen or asphalt intermingled in the stony particles. Bituminous rock therefore includes asphaltic earth, sand, sandstone, shale, and limestone, of which asphaltic sandstones and limestones are the most important.

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[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Bituminous rock with a wide range of bitumen content is found over a wide area in the United States, but the most important commercial deposits are found in the western half of Kentucky; in Uvalde County, Tex.; in southern Oklahoma; in Colbert County, Ala.; and in the vicinity of Santa Cruz, Calif. Only the first two are worked extensively.

Total sales of bituminous rock by producers in 1927 amounted to 796,100 short tons, valued at $4,672,280, or an average of $5.87 per ton. This amount represents an increase over 1926 of 18 per cent in volume and of 52 cents per ton in average value. Texas regained first place from the standpoint of volume of sales of bituminous rock, a position that it lost to Kentucky in 1923. Total sales in Texas in 1927 amounted to 376,770 tons, an increase over 1926 of 86,790 tons, or 30 per cent. Sales in Kentucky, the other important producing State, amounted to 344,220 tons, a moderate increase over 1926. The average value of the Kentucky product in 1927 was $9.17 per ton as compared with $3.33 per ton for the bituminous rock produced in Texas. Nearly all the bituminous rock produced in Texas consists of impregnated limestone, whereas the major portion of the Kentucky product has for its base the Potsdam sandstone, the superior wearing qualities of which are stated to be the reason for the wide difference in average value cited above. Discounting this alleged superiority in wearing qualities it is undoubtedly true that the Kentucky producers have several economic factors in their favor, such as nearness to markets and absence of competition from petroleum asphalt.

Bituminous rock is used chiefly in paving. For this purpose a rock consisting of at least 6 per cent asphalt is quarried and by means of a series of crushings and mixings is brought to the proper consistency for direct application. Except for the fact that it is hard to handle in cold weather bituminous rock undoubtedly has superior qualities as a road-surfacing material.

Gilsonite.—Gilsonite, or uintaite, is found in the United States only in a narrow strip along the Colorado-Utah border. It occurs in veins, many of which are several feet wide and several miles long. In 1927 the total sales were from Utah and amounted to 42,580 tons, valued at $876,820, or an average of $20.59 a ton. This represents a slight increase over 1926, both in quantity and in average value. Gilsonite is used chiefly in the manufacture of paints and varnishes and as it possesses the property of rendering rubber resistant to oxidation and changes in temperature is used in the rubber trade as a substitute for carbon black.

Grahamite.—Grahamite, though widely distributed in the United States, does not occur in deposits of sufficient size to allow competition with other materials used for the same purpose; that is, in roofing. No commercial production of grahamite has been reported since 1924.

Ozokerite.—Ozokerite or mineral wax is found in the United States only in Utah, in Wasatch and Utah Counties. Despite the continued strong competition from the famous ozokerite deposits at Boryslaw, Galicia, the trade in domestic ozokerite showed some improvement in 1927, when sales of 80 tons were recorded. These sales, all in Utah, were assigned the exceptionally high average at the mines of 20 cents per pound. Imports of "ozokerite and other mineral waxes" in 1927 aggregated approximately 7,600,000 pounds, valued at nearly $580,000, which in comparison with 1926 represents a decrease in quantity but a material increase in average value per pound. Ozokerite, by reason of its high melting point, has several special uses for which ordinary wax obtained from petroleum would be unsuitable. It is used chiefly as a substitute for paraffin wax in the manufacture of paper to cover products, which are wrapped before cooling, such as bread; as the principal constituent in high-grade wax candles; and in polishes.

Wurtzilite.—Wurtzilite, often called elaterite, is found only in Uinta County, Utah, where it occurs, like gilsonite, as veins. Total sales of wurtzilite in 1927 aggregated 280 tons, valued at $24,750, as compared with 240 tons, valued at $22,890, in 1926. After conversion to wurtzilite asphalt or "kapack," wurtzilite is used chiefly in the manufacture of resistant paints.

Native asphalt and related bitumens sold at mines in the United States, 1923–1927, by varieties and by States

[Value f. o. b. mine]

	1923		1924		1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Bituminous rock:										
Alabama	1, 200	$4, 200	8, 498	$29, 743	23, 550	$77, 080	22, 000	$101, 000	32, 650	$128, 700
Oklahoma	25, 800	150, 100	17, 961	80, 825	27, 450	82, 830	37, 010	121, 830	42, 460	132, 380
California	2, 945	11, 780	3, 731	14, 088	2, 680	16, 100	3, 330	19, 310		
Kentucky	184, 300	1, 468, 396	274, 743	2, 386, 557	286, 850	2, 493, 360	320, 430	2, 530, 480	344, 220	3, 156, 700
Missouri	-----	-----	300	3, 150	-----	-----	-----	-----	-----	-----
Texas	151, 356	555, 533	220, 598	779, 696	204, 530	692, 730	289, 980	825, 610	376, 770	1, 254, 500
Total	365, 601	2, 190, 009	525, 831	3, 294, 059	545, 060	3, 362, 100	672, 750	3, 598, 230	796, 100	4, 672, 280
Gilsonite: Utah	34, 425	681, 622	35, 907	603, 620	39, 520	767, 900	42, 190	863, 840	42, 580	876, 820
Grahamite: Utah	-----	-----	60	450	-----	-----	-----	-----	-----	-----
Ozokerite: Utah	10	2, 000	300	36, 000	-----	-----	-----	-----	80	32, 000
Wurtzilite: Utah	200	12, 000	269	24, 210	270	18, 400	240	22, 890	280	24, 750
Grand total	400, 236	2, 885, 631	562, 367	3, 958, 339	584, 850	4, 148, 400	715, 180	4, 484, 960	839, 040	5, 605, 850
RÉSUMÉ BY STATES										
Alabama	1, 200	4, 200	8, 498	29, 743	23, 550	77, 080	22, 000	101, 000	32, 650	128, 700
Oklahoma	25, 800	150, 100	17, 961	80, 825	27, 450	82, 830	37, 010	121, 830	42, 460	132, 380
California	2, 945	11, 780	3, 731	14, 088	2, 680	16, 100	3, 330	19, 310		
Kentucky	184, 300	1, 468, 396	274, 743	2, 386, 557	286, 850	2, 493, 360	320, 430	2, 530, 480	344, 220	3, 156, 700
Missouri	-----	-----	300	3, 150	-----	-----	-----	-----	-----	-----
Texas	151, 356	555, 533	220, 598	779, 696	204, 530	692, 730	289, 980	825, 610	376, 770	1, 254, 500
Utah	34, 635	695, 622	36, 536	664, 280	39, 790	786, 300	42, 430	886, 730	42, 940	933, 570
Grand total	400, 236	2, 885, 631	562, 367	3, 958, 339	584, 850	4, 148, 400	715, 180	4, 484, 960	839, 040	5, 605, 850

MANUFACTURED OR PETROLEUM ASPHALT

Although all asphalt is now recognized as having been derived from petroleum, native asphalt was refined by natural rather than by artificial agencies. Very little petroleum asphalt was manufactured before the twentieth century, as the asphaltic materials that were obtained as residuals by refining were of inferior quality. With the rise in production of asphaltic base petroleum in California during the early part of the twentieth century, the discovery of the beneficial results obtained by the use of steam in refining, and the growth of asphalt in public favor as a road-building material, the petroleum asphalt industry was placed on a firm basis and grew rapidly. A further impetus was supplied when Mexican petroleum, which has a high asphalt content, was imported in quantity for the first time. The petroleum asphalt industry has lacked the human interest features of the pitch-lake deposits of natural asphalt such as are found in Trinidad; at the same time it has been over-shadowed in the refining industry because of the fact that it has always been a comparatively minor product at refineries. Many are therefore surprised to learn that petroleum asphalt far outranks other asphalts in importance; in 1927 the total value of sales was nearly ten times that of native asphalts and related bitumens.

The asphalt manufactured at refineries in 1927 averaged approximately 5.5 barrels per short ton, a factor that, when applied to the total tonnage of sales, gives a total of nearly 22,000,000 barrels, equivalent to 2.7 per cent of the total crude petroleum run to stills.

Total sales of asphalt and asphaltic materials manufactured from petroleum in 1927 amounted to 3,951,450 tons, an increase over 1926 of 14 per cent. Of the total sales in 1927, 1,525,420 tons, or 39 per cent, was reported as having been produced from domestic crude petroleum and 2,426,030 tons, or 61 per cent, from foreign petroleum. This amount represents an increase in the proportion manufactured from domestic crude petroleum over a year ago, which may be attributed to material decline in the use of Mexican petroleum. The average value of the sales of manufactured asphalt in 1927 was $13.87 per ton as compared with $13.46 in 1926. The average value of the asphalt manufactured from domestic crude petroleum was 6 cents per ton higher than a year ago, and that from foreign crude petroleum 70 cents per ton higher.

In this report asphalt (or asphaltic materials) manufactured at refineries is divided into two classes—solid and semisolid products of less than 200 penetration and semisolid and liquid products of more than 200 penetration. The major portion of the latter class is known by the general term "flux," which, as the name implies, is used mainly as a blending material to bring the heavier grades of asphalt to specifications. The first class remained by far the more important of the two in 1927, with total sales of 2,861,520 tons, valued at $41,688,860, as against 1,089,930 tons, valued at $13,102,230, for the second class, including road oil.

The good roads demanded by the millions of motorists in the United States have proved a boon to the asphalt industry, particularly to manufacturers of paving asphalts. Asphalt is chiefly used in paving and, while subject to keen competition from cement, in the form of concrete, and coal tars, has grown in favor. Total sales of paving asphalts and fluxes in 1927 amounted to 1,881,990 tons, valued at $28,246,180, which represents 48 and 52 per cent, respectively, of the total quantity sold and the total realization. These totals do not include road oil to the amount of 297,110 tons, valued at $3,129,520.

Paving was not the only important factor in the growth of the asphalt industry in 1927, for the roofing and waterproofing branch also made notable progress in that year. Roofing and waterproofing (that is, saturating or coating felts and burlaps with asphalt) used a total of 1,302,560 tons of asphalts and fluxes, valued at $17,429,470. These figures represent increases of 16 and 17 per cent over 1926 in quantity and value, respectively.

The East coast refining district, comprising the refineries of the Atlantic seaboard, remained by far the most important asphalt-producing area in 1927. Slightly over 50 per cent of the refinery output of asphalt in 1927 was reported by these refineries. The output of both the Louisiana Gulf coast and the California district showed small gains over 1926 and these districts retained their rank as the second and third most important producing areas, respectively. The Atlantic seaboard refineries continue to dominate the petroleum asphalt market because they are nearest the foreign producing fields. The foreign crude petroleum run to stills in the East coast district in 1927 amounted to 40,642,000 barrels, as compared with 29,296,000 barrels in 1926.

The Bureau of Public Roads reports a total of 19,572 miles of State highways surfaced in 1927, of which 1,606 miles, or 8 per cent, was reported as surfaced with bituminous macadam by penetration, with sheet asphalt, or with bituminous concrete, in which both asphalt and tars were used as binders. The asphalt used in this way, however, represents only a small fraction of the asphalt used in paving in 1927, as streets in cities and towns, the great users of surfacing materials, are not included in this survey.

Asphalt and asphaltic material manufactured in the United States from petroleum and sold at refineries, 1926 and 1927, by varieties

[Value f. o. b. refinery]

	From domestic petroleum		From foreign petroleum		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1926						
Solid and semisolid products of less than 200 penetration:[1]						
Asphalt—						
Paving	471, 000	$6, 026, 920	868, 320	$12, 928, 530	1, 339, 320	$18, 955, 450
Roofing and waterproofing	297, 020	3, 738, 250	484, 600	6, 898, 790	781, 620	10, 637, 040
Mineral rubber	25, 570	544, 380	16, 920	250, 850	42, 490	795, 230
Other solid and semisolid products	101, 720	1, 263, 100	137, 030	2, 049, 330	238, 750	3, 312, 430
	895, 310	11, 572, 650	1, 506, 870	22, 127, 500	2, 402, 180	33, 700, 150
Semisolid and liquid products of more than 200 penetration:[1]						
Flux—						
Paving	14, 340	175, 460	112, 470	1, 422, 950	126, 810	1, 598, 410
Roofing and waterproofing	55, 960	684, 290	285, 450	3, 542, 770	341, 410	4, 227, 060
Other	1, 930	34, 450	168, 410	1, 983, 840	170, 340	2, 018, 290
Other liquid products	59, 150	499, 680	24, 530	323, 290	83, 680	822, 970
	131, 380	1, 393, 880	590, 860	7, 272, 850	722, 240	8, 666, 730
Road oil	218, 470	2, 486, 410	115, 580	1, 698, 110	334, 050	4, 184, 520
Grand total	1, 245, 160	15, 452, 940	2, 213, 310	31, 098, 460	[2] 3, 458, 470	46, 551, 400
1927						
Solid and semisolid products of less than 200 penetration:[1]						
Asphalt—						
Paving	556, 280	8, 199, 100	1, 095, 910	16, 978, 260	1, 652, 190	25, 177, 360
Roofing and waterproofing	457, 460	5, 471, 350	561, 190	8, 407, 880	1, 018, 650	13, 879, 230
Mineral rubber	4, 840	86, 410	16, 070	244, 520	20, 910	330, 930
Other solid and semisolid products	78, 180	928, 810	91, 590	1, 372, 530	169, 770	2, 301, 340
	1, 096, 760	14, 685, 670	1, 764, 760	27, 003, 190	2, 861, 520	41, 688, 860
Semisolid and liquid products of more than 200 penetration:[1]						
Flux—						
Paving	22, 470	311, 810	207, 330	2, 757, 010	229, 800	3, 068, 820
Roofing and waterproofing	100, 350	1, 151, 680	183, 560	2, 398, 560	283, 910	3, 550, 240
Other	860	14, 420	190, 350	2, 461, 770	191, 210	2, 476, 190
Other liquid products	62, 140	506, 970	25, 760	370, 490	87, 900	877, 460
	185, 820	1, 984, 880	607, 000	7, 987, 830	792, 820	9, 972, 710
Road oil	242, 840	2, 348, 600	54, 270	780, 920	297, 110	3, 129, 520
Grand total	1, 525, 420	19, 019, 150	2, 426, 030	35, 771, 940	[2] 3, 951, 450	54, 791, 090

[1] Definitions:

Paving asphalt.—Refined native asphalt and asphaltic cement, fluxed and unfluxed, produced for direct use in the construction of sheet asphalt, asphaltic concrete, asphalt macadam, and asphalt block pavements, and also for use as joint filler in brick, block, and monolithic pavements.

Roofing and waterproofing asphalt.—Asphalt and asphaltic cement used in saturating, coating, and cementing felt or other fabric and in the manufacture of asphalt shingles.

Mineral rubber.—Asphalt and asphaltic cement used by the rubber industry.

Other solid and semisolid products.—Asphalt and asphaltic cement used as dips and in the manufacture of insulating material, acid-resisting compounds, putty, mastic, and briquets and not included in the preceding definitions.

Flux.—Liquid asphaltic material used in softening native asphalt or solid petroleum asphalt for paving, roofing, waterproofing, and other purposes.

Other liquid products.—Petroleum asphalt used in the manufacture of saturant, paint, varnish, or other coating, exclusive of fuel oil, and not included in the preceding definitions.

Road oil.—Residual asphaltic oil used for surface treatment.

[2] The difference between this total and that reported under refinery statistics in the next table is due partly to differences in classification of liquid products (for example, road oil in the refinery statistics is classed as a miscellaneous product and not as asphalt), and partly to the fact that the figures in this table represent sales and those recorded in the refinery table are for production.

REFINERY STATISTICS

The following data were obtained through a regular monthly canvass of refineries; the totals do not agree with the totals for asphalt produced from petroleum (p. 73) obtained by means of an annual canvass, primarily because of differences in classification.

Asphalt produced at refineries in the United States, 1926 and 1927, in thousands of short tons

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1926													
East coast	60.9	53.0	88.1	88.2	93.8	151.3	128.2	159.9	162.7	174.4	99.1	109.1	1,368.7
Appalachian	------	------	------	------	------	------	------	------	------	------	------	------	------
Indiana, Illinois, etc	18.0	16.9	16.8	16.6	17.5	16.6	16.4	16.2	16.1	17.5	17.3	16.8	202.7
Oklahoma, Kansas, etc	.7	.7	.6	.7	.7	.7	.5	.4	.5	.5	.4	.4	6.8
Texas	16.1	21.2	24.2	14.3	27.0	23.8	26.7	23.4	26.5	17.1	23.9	17.2	261.4
Louisiana and Arkansas	27.1	30.9	35.4	34.5	55.1	59.2	59.8	56.0	54.6	59.1	32.7	35.0	539.4
Rocky Mountain	1.7	2.1	1.5	2.2	2.5	4.0	3.4	3.1	6.6	3.4	1.6	1.0	33.1
California	37.9	27.7	44.0	42.1	51.8	45.7	46.2	47.3	41.5	51.3	41.0	34.2	510.7
	162.4	152.5	210.6	198.6	248.4	301.3	281.2	306.3	308.5	323.3	216.0	213.7	2,922.8
1927													
East coast	73.3	79.5	107.5	141.0	169.0	192.6	175.7	178.5	174.3	170.3	138.7	116.7	1,717.1
Appalachian	------	------	------	.4	------	1.4	.7	------	------	------	------	------	2.5
Indiana, Illinois, etc	23.3	20.5	23.4	18.4	22.3	23.5	27.3	23.4	25.4	29.5	33.4	32.8	303.2
Oklahoma, Kansas, etc	.8	.8	.7	.7	.7	.7	.4	.4	.4	.4	.5	.5	7.0
Texas	20.9	12.7	18.3	20.6	18.3	19.6	21.2	22.1	19.4	21.6	26.4	20.2	241.3
Louisiana and Arkansas	40.5	26.5	35.2	48.7	56.9	57.5	58.9	57.7	58.1	51.2	45.1	48.6	584.9
Rocky Mountain	.4	.3	1.0	2.2	4.3	4.2	3.8	4.0	2.5	1.3	2.6	.9	27.5
California	32.0	32.4	36.2	41.8	47.5	46.7	46.7	53.4	53.0	58.3	43.3	42.9	534.2
	191.2	172.7	222.3	273.8	319.0	346.2	334.7	339.5	333.1	332.6	290.0	262.6	3,417.7

Asphalt in stock at refineries in the United States at end of each month, 1926 and 1927, in thousands of short tons

	January	February	March	April	May	June	July	August	September	October	November	December
1926												
East coast	81.2	85.2	103.9	143.1	124.6	97.8	78.6	93.7	84.4	79.0	60.6	77.5
Appalachian	.1	.1	.1				.1					
Indiana, Illinois, etc	15.7	16.8	17.1	17.4	18.5	16.3	20.4	21.3	18.6	21.2	22.8	28.0
Oklahoma, Kansas, etc	.8	.8	.8	.9	1.1	1.5	1.5	1.5	1.4	1.4	1.0	.9
Texas	10.8	12.5	7.6	8.4	9.0	9.3	7.4	6.8	10.0	7.0	7.4	8.3
Louisiana and Arkansas	27.4	29.2	29.4	28.9	29.9	28.3	30.1	33.3	29.7	28.9	25.7	27.3
Rocky Mountain	7.8	8.4	8.5	9.4	9.1	9.5	8.8	8.0	8.2	8.0	8.2	7.9
California	30.8	29.1	27.7	31.9	37.6	38.1	38.2	35.6	36.3	42.3	41.1	43.4
	174.6	182.1	195.1	240.0	229.8	200.8	185.1	200.2	188.6	187.8	166.8	193.3
1927												
East coast	79.9	90.8	95.8	88.6	92.1	100.3	87.8	75.4	61.6	75.5	77.9	89.5
Appalachian				.4	.5	1.9	2.5	2.5	2.3	1.9	.9	.5
Indiana, Illinois, etc	40.2	41.3	40.6	34.3	33.6	31.3	27.3	24.4	23.2	21.7	20.8	23.9
Oklahoma, Kansas, etc	.9	1.2	1.4	1.7	1.5	1.5	1.4	1.7	1.4	1.4	1.7	1.6
Texas	9.1	10.1	10.0	9.3	7.7	8.1	8.4	8.3	6.4	8.5	8.3	10.9
Louisiana and Arkansas	34.1	33.7	31.0	27.2	22.8	22.9	22.1	18.5	21.3	21.5	26.1	32.7
Rocky Mountain	8.0	7.5	7.1	7.3	9.0	10.0	10.3	10.0	10.7	9.0	9.4	9.4
California	43.7	50.4	49.8	51.1	55.6	56.8	54.4	51.6	50.4	50.1	51.3	52.5
	215.9	235.0	235.7	219.9	222.8	232.8	214.2	192.4	177.3	189.6	196.4	221.0

Foreign crude petroleum run to stills at refineries in the United States, 1926 and 1927, in thousands of barrels

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1926													
East coast	1,948	1,860	2,664	2,287	2,386	2,113	2,249	2,663	2,896	2,656	2,572	3,002	29,296
Texas Gulf coast	441	459	513	460	219	266	305	248	217	171	238	147	3,684
Louisiana Gulf coast	311	904	933	1,041	1,159	1,235	1,216	1,247	1,123	859	967	988	11,983
	2,700	3,223	4,110	3,788	3,764	3,614	3,770	4,158	4,236	3,686	3,777	4,137	44,963
1927													
East coast	2,499	2,326	2,968	2,823	2,776	3,020	3,222	3,888	3,817	4,670	4,756	5,282	42,047
Texas Gulf coast	120	58	85	100	109	96	51	24	23	43	21	84	814
Louisiana Gulf coast	1,032	765	734	466	549	522	562	591	549	525	456	494	7,245
	3,651	3,149	3,787	3,389	3,434	3,638	3,835	4,503	4,389	5,238	5,233	5,860	50,106

IMPORTS AND EXPORTS

Native asphalt and bituminous rock imported into the United States, 1924–1927, by countries

[General imports]

Country	1924		1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
North America:								
Bermuda			4	$428				
Canada	1,275	$17,105	9	920	167	$2,211	19	$673
Mexico			(1)	25	1,668	24,390		
West Indies:								
British—								
Barbados	20	2,430	76	5,123	190	7,861	21	2,292
Jamaica			836	8,360				
Trinidad and Tobago	84,282	666,669	76,820	526,999	76,562	562,888	85,038	626,566
Other	134	600	58	1,336			2,319	17,419
Cuba	346	9,203	2,323	60,535	11,886	94,087	2,616	27,714
South America:								
Argentina			11	182	12	86	53	1,111
Colombia	55	627	22	1,473				
Ecuador					4,637	30,636		
Venezuela	73,309	490,895	37,160	246,558	46,292	305,854	66,254	437,744
Europe:								
Azores and Madeira Islands							(1)	5
Belgium							7	63
Czechoslovakia							1	25
Denmark					49	800	3	126
France					3	78	2	140
Germany	902	12,123	1,465	19,817	1,126	15,167	1,619	20,613
Italy	11	1,322						
Netherlands	(1)	5	1	12	(1)	10	2	310
Poland and Danzig							4	100
Switzerland	1	233	3	185	2	483	58	495
United Kingdom	77	1,236	3,367	34,633	10	545	81	5,029
Yugoslavia and Albania					28	500		
Asia:								
Palestine and Syria	7	711	7	838				
	160,419	1,203,159	122,162	907,424	142,632	1,045,596	158,097	1,140,425

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[1] Figures for quantity not available.

Ozokerite and other mineral waxes imported for consumption in the United States, 1918–1927

Year	Pounds	Value	Year	Pounds	Value
1918	1,809,459	$147,805	1923	4,856,357	$213,407
1919	3,748,080	454,840	1924	3,113,819	207,833
1920	4,272,341	499,758	1925	6,175,184	361,767
1921	8,548,542	546,054	1926	8,287,397	479,957
1922	8,989,972	371,161	1927	7,599,708	579,118

Asphalt and related bitumens exported from the United States, 1918–1927

Year	Native asphalt				Petroleum asphalt		Total value
	Unmanufactured		Manufactures of	Total	Short tons	Value	
	Short tons	Value					
1918	22,108	$577,654	$577,936	$1,155,590	(1)	(1)	(1)
1919	40,208	1,103,930	606,918	1,710,848			
1920	51,706	1,356,116	842,074	2,198,190			
1921	45,367	1,178,038	621,224	1,799,262			
1922	57,362	1,344,440	[2] 1,261,125	2,605,565			
1923	72,628	1,500,869	[2] 2,075,628	3,576,497			
1924	52,568	1,245,670	[2] 2,212,260	3,457,930			
1925	32,835	825,654	[2] 2,525,618	3,351,272	89,014	$1,762,048	$5,113,320
1926	38,218	905,743	[2] 2,189,808	3,095,551	146,589	3,183,746	6,279,297
1927	39,875	1,034,334	[2] 2,399,700	3,434,034	385,031	8,325,413	11,759,447

[1] Exports of petroleum asphalt not separately classified prior to 1925.

[2] Inclusive of value of squares (10 by 10 feet) of roofing asphalt as follows: 1922, 588, 636 squares, $870,200; 1923, 783,028 squares, $1,124,491; 1924, 697,293 squares, $998,469; 1925, 661,662 squares, $919,977; 1926, 938,176 squares, $1,212,409; 1927, 853,842 squares, $1,150,722. Corresponding exports not separately shown prior to 1922.

Asphalt exported from the United States in 1927, by countries

Country	Native asphalt and bitumen				Petroleum asphalt	
	Unmanufactured		Manufactures of, except roofing		Short tons	Value
	Short tons	Value	Short tons	Value		
North America:						
Bermuda	------	------	1	$45	------	------
Canada	4,996	$95,017	7,365	163,142	37,855	$594,323
Central America—						
British Honduras	------	------	------	------	7	105
Costa Rica	------	------	4	600	109	3,338
Guatemala	------	------	3	184	------	------
Honduras	314	13,786	1	40	1,309	44,264
Nicaragua	------	------	------	------	129	2,483
Panama	143	3,597	63	6,618	258	6,468
Salvador	------	------	------	------	1,007	24,186
Mexico	15	500	52	5,800	367	7,985
Newfoundland and Labrador	------	------	21	448	------	------
West Indies—						
British—						
Barbados	------	------	------	------	2	105
Jamaica	------	------	390	16,634	2	25
Trinidad and Tobago	------	------	1	280	------	------
Other	------	------	(1)	54	452	36,963
Cuba	1,188	14,221	704	14,960	112	2,831
Dominican Republic	225	4,562	2	598	871	17,368
Haiti	------	------	1	122	171	5,474
Netherland	------	------	1	71	------	------
Virgin Islands of the United States	------	------	(1)	82	34	1,239
South America:						
Argentina	38	1,132	790	31,307	3,032	67,217
Brazil	16	202	1,642	76,215	1,721	39,227
Chile	6	50	744	22,024	153	4,359
Colombia	342	5,979	262	10,070	1,483	30,820
Ecuador	9	339	24	816	249	6,103
Guiana, British	------	------	1	200	------	------
Paraguay	------	------	1	445	16	506
Peru	18	1,572	69	8,986	1,662	31,964
Uruguay	22	556	1,479	69,801	531	12,526
Venezuela	15	550	57	3,031	12	354
Europe:						
Azores and Madeira Islands	------	------	3	173	------	------
Belgium	432	17,063	103	3,203	5,022	115,551
Denmark	6	274	138	4,052	1,564	35,699
Estonia	------	------	------	------	49	933
Finland	50	1,215	50	7,144	46	1,790

[1] Less than 1 ton.

Asphalt exported from the United States in 1927, by countries—Continued

Country	Native asphalt and bitumen				Petroleum asphalt	
	Unmanufactured		Manufactures of, except roofing		Short tons	Value
	Short tons	Value	Short tons	Value		
Europe—Continued.						
France	1,795	$60,657	1,269	$39,884	29,888	$661,552
Germany	11,954	346,620	3,123	82,155	81,982	2,069,991
Greece	8	391	2	175	24	608
Hungary	---------	---------	14	2,047	---------	---------
Irish Free State	---------	---------	---------	---------	78	2,215
Italy	525	15,155	300	13,476	6,394	137,518
Netherlands	12,487	299,307	184	5,966	57,122	1,300,451
Norway	7	453	345	16,051	719	16,662
Soviet Russia	---------	---------	---------	---------	24	614
Spain	22	824	1,729	52,708	3,082	75,673
Sweden	109	4,322	247	8,943	2,581	59,951
Switzerland	---------	---------	1	48	---------	---------
Turkey in Europe	---------	---------	6	1,874	44	1,082
United Kingdom	4,748	129,662	3,141	238,796	35,781	785,433
Yugoslavia and Albania	---------	---------	---------	---------	748	13,148
Asia:						
Aden			---------	---------	2	83
Ceylon	---------	---------	28	1,169	5,499	119,916
China	---------	---------	141	11,322	6,541	130,762
East Indies—						
British—						
India	---------	---------	2,760	177,740	9,435	234,258
Malaya	---------	---------	124	6,277	4,943	81,259
Netherland—						
Java and Madura	---------	---------	51	5,169	12,046	195,335
Other	---------	---------	---------	---------	2,384	40,416
Indo-China (French)	---------	---------	---------	---------	4,204	62,174
Hong Kong	---------	---------	---------	---------	1,999	34,614
Japan, including Chosen	157	7,465	196	17,124	13,965	292,984
Kwantung	---------	---------	---------	---------	792	19,074
Philippine Islands	2	46	11	737	1,970	38,915
Siam	---------	---------	4	807	17	473
Africa:						
British—						
East	---------	---------	41	3,092	1,101	25,271
South (Union of)	10	1,134	523	51,067	5,048	131,699
West	---------	---------	---------	---------	12	583
Canary Islands	---------	---------	---------	---------	1	38
Egypt	---------	---------	125	9,145	---------	---------
French—						
Algeria and Tunisia	---------	---------	---------	---------	1,208	21,392
Other	---------	---------	---------	---------	212	7,152
Portuguese—						
Mozambique	---------	---------	67	6,649	28	825
Other	---------	---------	6	1,521	---------	---------
Oceania, British:						
Australia	176	6,738	972	34,696	30,922	563,452
New Zealand	9	366	186	13,195	5,718	101,602
Other	31	579	---------	---------	292	4,032
	39,875	1,034,334	29,568	1,248,978	385,031	8,325,413

WORLD PRODUCTION

Natural asphalt and related bitumens produced in the principal producing countries, 1923–1927, in metric tons [1]

[Compiled by L. M. Jones, of the Bureau of Mines]

Country [2]	1923	1924	1925	1926	1927
Barbados [3]	152	71	30	109	8
Canada (Alberta) [4]	(5)	482	1,041	479	2,455
Cuba [6]	2,098	3,643	1,534	8,682	3,202
France	40,292	51,491	52,446	52,900	48,530
Germany	46,244	57,359	64,115	60,966	117,836
Greece	1,300	5,013	5,256	402	(5)
Italy	151,908	187,244	273,668	313,525	356,945
Netherland East Indies	------------	650	670	155	1,340
Peru	(5)	2,708	1,068	690	(5)
Poland [7]	710	732	738	723	741
Rumania	21,967	19,731	15,712	24,891	30,712
Russia [8]	(5)	[9] 92	11,680	32,579	(5)
Spain	3,936	5,476	5,580	5,856	4,514
Switzerland [6]	19,910	33,159	35,757	28,200	36,716
Trinidad	224,900	227,460	204,335	241,109	246,017
United States	363,086	510,168	530,564	648,797	761,160
Venezuela	33,321	69,892	33,679	51,552	(5)
Yugoslavia	------------	97	286	85	46

[1] Minerals included are native asphalt, asphalt rock, asphaltite, manjak, ozokerite, and bituminous rock used for other purposes than the extraction of oil. Oil shales, including ichthyolic shale, are not included.

[2] In addition to those listed, the following countries are reported to produce asphalt and related bitumens, but figures of output are not available: Albania, Iraq, Madagascar, and Syria.

[3] Exports of manjak.

[4] Bituminous sands.

[5] Data not available.

[6] Exports.

[7] Ozokerite.

[8] Year ended September 30.

[9] Ozokerite only. Data on production of asphalt and bituminous rock not available.

PRODUCERS

NATIVE ASPHALT AND RELATED BITUMENS

Production of native asphalt and related bitumens was reported in this country in 1927 by the following operators:

Alabama Rock Asphalt (Inc.), 310 Pioneer Building, Birmingham, Ala.
American Asphalt Association, 919 Wainwright Building, St. Louis, Mo.
Bitumen Mines Operation, 701 Post Street, San Francisco, Calif.
Colbert Limerock Asphalt Co., Cherokee, Ala.
Crown Rock Asphalt Co., 911 Neave Building, Cincinnati, Ohio.
Diamond Gilsonite Co., 587 Court Street, Brooklyn, N. Y.
Garfield Rock Asphalt Co., 340 Starks Building, Louisville, Ky.
Gilson Asphaltum Co., 1600 Arch Street, Philadelphia, Pa.
Kentucky Rock Asphalt Co., Marion E. Taylor Building, Louisville, Ky.
Natural Rock Asphalt Corporation, Owensboro, Ky.
Ohio Valley Rock Asphalt Co., Louisville, Ky.
Ozokerite Mining Co. (Inc.), Soldier Summit, Utah.
Raven Mining Co. of Utah, 140 South Dearborn Street, Chicago, Ill.
Rock Asphalt Corporation, Cherokee, Ala.
Texas Rock Asphalt Co., San Antonio, Tex.
United Rock Asphalt Co., 1610 Intersouthern Building, Louisville, Ky.
Utah Gilsonite Co., Wainwright Building, St. Louis, Mo.
Uvalde Rock Asphalt Co., San Antonio, Tex.
Western Paving Co., 1519 Petroleum Building, Oklahoma City, Okla.
White's Uvalde Mines, P. O. Box 902, San Antonio, Tex.

MANUFACTURED ASPHALT

The following operators reported the production of asphaltic material from crude petroleum in the United States in 1927:

Atlantic Refining Co., 260 South Broad Street, Philadelphia, Pa.
Barber Asphalt Co., 1600 Arch Street, Philadelphia, Pa.
Beacon Oil Co., 111 Devonshire Street, Boston, Mass.
Eureka Petroleum Corporation, Box 187, Arcade Station, Los Angeles, Calif.
Freeport Asphalt Co., Freeport, Tex.
Gulf Refining Co., Frick Building Annex, Pittsburgh, Pa.
Indian Refining Co., Lawrenceville, Ill.
Lincoln Oil Refining Co., Robinson, Ill.
Louisiana Oil & Refining Corporation, Shreveport, La.
Mexican Petroleum Corporation, 120 Broadway, New York, N. Y.
Mexican Petroleum Corporation of Louisiana (Inc.), 120 Broadway, New York, N. Y.
Midwest Refining Co., Denver, Colo.
New England Oil Refining Co., Fall River, Mass.
New Orleans Refining Co., United Fruit Building, New Orleans, La.
Orange County Refining Co., 317½ East Second Street, Los Angeles, Calif.
Pan American Petroleum Co., 1034 Petroleum Securities Building, Los Angeles, Calif.
Paraffine Companies (Inc.), 475 Brannan Street, San Francisco, Calif.
Seaside Oil Co., Summerland, Calif.
Sinclair Refining Co. of Louisiana (Inc.), 45 Nassau Street, New York, N. Y.
Standard Oil Co. of California, 225 Bush Street, San Francisco, Calif.
Standard Oil Co. (Indiana), 910 South Michigan Avenue, Chicago, Ill.
Standard Oil Co. of Louisiana, Baton Rouge, La.
Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y.
Standard Oil Co. of New York, 26 Broadway, New York, N. Y.
Standard Oil Co. of Ohio, East Ohio Gas Building, Cleveland, Ohio.
Sun Oil Co., 1428 South Penn Square, Philadelphia, Pa.
The Texas Co., Houston, Tex.
Tidewater Oil Co., 11 Broadway, New York, N. Y.
Union Oil Co. of California, Union Oil Building, Los Angeles, Calif.
Warner Quinlan Co., 2 Park Avenue, New York, N. Y.

ASPHALT ASSOCIATIONS

The members of the asphalt industry established in 1919 the Asphalt Association, which, in addition to other activities, is engaged in collecting and disseminating information useful to both producers and users of asphalt. The address of the association is 441 Lexington Avenue, New York, N. Y. Branch offices are at the following addresses:

1319 F Street NW., Washington, D. C.
729 Hearst Building, Hearst Square, Chicago, Ill.
Whitney Central Building, New Orleans, La.
25 North Pearl Street, Albany, N. Y.
501 Wilder Building, Charlotte, N. C.
Excelsior Life Insurance Building, Toronto, Ontario, Canada.

The officers are: President, J. S. Helm, of the Standard Oil Co. of New Jersey; vice president, L. M. Law, of the New Orleans Refining Co.; treasurer, Herbert Spencer, of the Standard Oil Co. of New Jersey; secretary and general manager, J. E. Pennybacker.

The Western Asphalt Association, patterned after the association noted above and composed of the leading producers of asphalt on the Pacific coast and the large contractors who build asphalt roads, was formed during the latter part of 1926. Its purpose is to educate the public as to the merits of asphaltic-type roads and to carry on research work. The headquarters of this association are at 805 Quinby Building, Los Angeles, Calif.

SLATE

By A. T. Coons

SUMMARY

Slate sold by producers in the United States in 1927 was valued at $11,380,736, a decrease of 8 per cent from the value for 1926. The quantity of slate sold, approximately 692,040 short tons in 1927, represented a decrease of 4 per cent.

There was an increase of less than 1 per cent in the number of squares of roofing slate sold in 1927 compared with 1926. The value, however, decreased 2.5 per cent. The average value per square in 1927 was $10.56; in 1926 it was $10.90.

Total sales of mill stock in 1927 declined 10 per cent in quantity. The decreases were in slate for structural use, 7 per cent; electrical slate, 24 per cent; slate for blackboards and bulletin boards, 7 per cent; and for school slates, 20 per cent. Slate for vaults and covers and for billiard-table tops increased 8 per cent and 10 per cent, respectively, in quantity. Sales of slate for walk ways, flagstones, crosswalks, stepping-stones, etc., have steadily increased in the last few years, and sales of nearly twice as much of this material were reported in 1927 as in 1926.

Sales of crushed slate in the form of granules and slate flour were 8 per cent less in 1927 than in 1926. The average value was the same in 1927 ($6.04 a ton) as in 1926. Other stone, chiefly a "greenstone" which is an altered diabase, crushed into granules and sold in 1927 amounted to 136,340 short tons, valued at $858,630, as shown in the chapter on stone.

The slate-quarrying companies that reported operation in 1927 numbered 118, or 4 less than in 1926. In New York and Vermont many small quarries are intermittently worked on a small scale for roofing slate. The product of these quarries is generally sold with that of some of the larger quarries, and much of it consists of "freak" or odd-colored slate of unusual size or thickness for use in special work.

As slate from many of the small producers is sold by the larger producing companies the possibility of duplication of returns must be considered in the compilation of operators' reports. In the compilation of this report special care has been taken to avoid duplication.

PRODUCTION

The following tables show sales of slate, by uses, from 1918 to 1927. The total quantity and value given for each use are the totals of the reports of the quarrymen (not the selling agents), and the value is that f. o. b. quarry or nearest point of shipment. Some of the mill stock may ultimately be used for purposes other than those reported by the quarrymen.

Slate sold by producers in the United States, 1918–1927, by uses

[Value is at point of shipment]

Year	Roofing slate		Mill stock		Other uses[1] (value)	Total value
	Squares (100 square feet)	Value	Square feet	Value		
1918	379,817	$2,219,131	7,204,000	$1,853,603	$768,386	$4,841,120
1919	454,337	3,085,957	7,466,000	1,782,793	1,161,898	6,030,648
1920	396,230	3,524,658	9,910,000	3,147,281	2,054,503	8,726,442
1921	348,085	3,197,745	8,970,000	2,719,723	1,404,538	7,322,006
1922	479,243	4,069;761	9,276,800	2,899,195	2,207,828	9,176,784
1923	507,587	4,582,535	11,109,480	4,159,644	3,334,445	12,076,624
1924	469,393	4,626,614	10,009,180	3,922,366	3,227,036	11,776,016
1925	494,530	5,084,945	11,077,860	4,231,477	3,258,904	12,575,326
1926	465,900	5,079,087	10,278,130	4,191,185	3,082,495	12,352,767
1927	468,560	4,949,940	9,287,680	3,519,386	2,911,410	11,380,736

[1] Chiefly slate granules.

In approximating the tonnage for the different slate products given in the table that follows, a specific gravity of 2.75 has been used as the basis of calculation, and thicknesses ranging from three-sixteenths inch to 2 inches to correspond to the averages for the several products. Heretofore the calculation has been made on the aggregate quantity of each variety of product, but for 1927 the calculation was made on the individual lots reported by each producer. This resulted in a somewhat higher tonnage than would have been obtained by the method formerly employed. This is especially noticeable for roofing slate. The thickness of the individual slates sold—especially in New York and Vermont—has increased greatly in the last few years, owing to the demand for better roofs and for architectural effects. The weights of a square of slate as reported by the quarrymen ranged from 670 pounds to 2,000 pounds.

Roofing slate, mill stock,[1] and slate granules (including slate "flour") sold by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Roofing ... squares	465,900	$5,079,087	468,560	$4,949,940
Approximate equivalent in short tons	157,450		176,540	
Electrical ... square feet	1,857,940	1,537,034	1,417,060	1,155,502
Approximate equivalent in short tons	13,350		12,420	
Structural and sanitary ... square feet	2,590,340	988,521	2,420,730	944,577
Approximate equivalent in short tons	18,550		18,760	
Grave vaults and covers ... square feet	490,060	130,882	530,740	140,947
Approximate equivalent in short tons	6,900		4,920	
Blackboards and bulletin boards ... square feet	3,998,800	1,356,405	3,735,870	1,116,598
Approximate equivalent in short tons	10,700		10,490	
Billiard-table tops ... square feet	367,220	145,457	402,700	141,764
Approximate equivalent in short tons	2,700		3,450	
School slates ... pieces	1,820,820	32,886	1,459,100	19,998
Approximate equivalent in square feet	973,770		780,580	
Approximate equivalent in short tons	1,300		900	
Granules ... short tons	498,050	3,009,368	459,760	2,775,962
Other[2] ... short tons (estimated)	9,000	73,127	4,800	135,448
Total (quantities approximate, in short tons)	718,000	12,352,767	692,040	11,380,736

[1] Mill stock sold, including school slates, was as follows: 1926, 10,278,130 square feet, valued at $4,191,185; 1927, 9,287,680 square feet, valued at $3,519,386.

[2] Includes slate sold for flagging, crosswalks, stepping-stones, walk ways, etc. (379,830 square feet, valued at $63,441, in 1926, and 726,300, square feet, valued at $132,095, in 1927), tombstones, waste slate, and other uses not specified.

Slate sold by producers in the United States, 1926–27, by States and uses

State	Operators	Roofing		Mill stock		Other uses (value) [1]	Total value
		Squares (100 square feet)	Value	Square feet	Value		
1926							
Arkansas	1	----------	----------	----------	----------	(2)	(2)
California	3	----------	----------	----------	----------	$2,976	$2,976
Georgia	1	(2)	(2)	(2)	(2)	(2)	(2)
Maine	3	(2)	(2)	(2)	(2)	(2)	662,184
Maryland	3	(2)	(2)	(2)	(2)	(2)	207,989
New York	17	11,093	$177,455	----------	----------	736,359	913,814
Pennsylvania	43	263,668	2,127,782	8,645,980	$2,842,182	443,213	5,413,177
Tennessee	1	----------	----------	----------	----------	(2)	(2)
Vermont	46	148,926	2,310,410	1,011,370	768,178	1,188,453	4,267,041
Virginia	4	31,172	331,651	----------	----------	(2)	(2)
Undistributed [3]	--------	11,041	131,789	620,780	580,825	711,494	885,586
	122	465,900	5,079,087	10,278,130	4,191,185	3,082,495	12,352,767
1927							
California	1	----------	----------	----------	----------	(2)	(2)
Georgia	1	----------	----------	----------	----------	(2)	(2)
Maine	3	(2)	(2)	(2)	(2)	(2)	549,952
Maryland	3	(2)	(2)	(2)	(2)	(2)	205,812
New York	15	8,210	133,608	----------	----------	668,829	802,437
Pennsylvania	40	247,120	1,953,076	7,932,180	2,409,805	406,551	4,769,432
Tennessee	1	----------	----------	----------	----------	(2)	(2)
Vermont	49	172,490	2,369,300	797,180	599,476	1,140,135	4,108,911
Virginia	5	32,580	398,612	----------	----------	(2)	(2)
Undistributed [3]	--------	8,160	95,344	558,320	510,105	695,895	944,192
	118	468,560	4,949,940	9,287,680	3,519,386	2,911,410	11,380,736

[1] For details see table of general sales on p. 82 and table on p. 88 for Pennsylvania.
[2] Included under "Undistributed."
[3] Includes output of States entered as "(2)" above.

IMPORTS AND EXPORTS [1]

Value of slate imported for consumption in the United States, 1918–1927

Year	Value	Year	Value
1918	$321	1923	$16,881
1919	691	1924	32,095
1920	4,512	1925	64,570
1921	2,923	1926	86,681
1922	2,753	1927	78,909

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[1] The figures on imports and exports were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce, except as otherwise indicated.

Slate imported into the United States, 1924–1927, by countries

[General imports]

Country	1924		1925		1926 (value) [1]	1927 (value) [1]
	Pounds	Value	Pounds	Value		
Belgium			174	$15	$297	$282
Canada	930	$1,853	500	1,359	21	5
China			190	96	68	7
Czechoslovakia			554	9	16	3
Denmark			39,683	732		
France			63,935	2,044	29,465	9,450
Germany	97,466	3,849	5,008	386	9,201	323
Hong Kong	48	17	211	56	10	51
Italy	1,045,003	15,171	1,677,945	35,601	43,797	30,069
Japan	70	50	46	25	113	178
Netherlands			10	12	3	
Norway			25,575	1,833	506	2,040
Portugal	229,522	2,367	735,471	12,652	6,100	9,029
Spain					857	
Sweden	6,393	127	21,450	1,515		
Switzerland						1,580
United Kingdom	215,735	8,794	239,226	8,206	3,143	21,029
	1,595,167	32,228	2,809,978	64,541	93,597	74,046

[1] Quantity not recorded.

Roofing slate exported from the United States, 1918–1927

Year	Number of squares	Value	Year	Number of squares	Value
1918	(1)	$65,224	1923	8,462	$78,780
1919	(1)	55,164	1924	8,165	77,422
1920	(1)	122,105	1925	5,785	54,130
1921	(1)	101,630	1926	5,621	53,117
1922	1,040	97,811	1927	6,798	80,171

[1] Quantity not recorded.

Roofing slate exported from the United States, 1925–1927, by countries

Country	1925		1926		1927	
	Number of squares	Value	Number of squares	Value	Number of squares	Value
Africa (British):						
South	110	$593				
West	8	40				
Argentina			416	$4,016		
Canada	3,495	38,328	3,791	40,204	5,714	$70,974
Chile	140	816				
Mexico	72	380	522	1,548	92	1,270
Newfoundland and Labrador			70	840		
New Zealand	89	1,069	446	3,664	75	1,354
Panama	147	1,635	111	832	38	848
Philippine Islands					10	83
Siam	25	128				
United Kingdom					681	3,691
West Indies:						
British—						
Bermuda	122	1,570	45	286	31	421
Trinidad and Tobago	1,390	8,539	110	1,100	66	659
Other	32	376	110	627	62	243
Cuba	155	656			29	628
	5,785	54,130	5,621	53,117	6,798	80,171

The following figures for exports of slate other than roofing slate were collected by the Bureau of Mines from shippers of the products named. Of the slate reported in this table, all but a small amount of the blackboard and structural material was shipped to Canada, as was one-fourth of the electrical slate, about two-thirds of the slate used for billiard tables, and practically all of the granules. School slates were shipped to Canada and to other countries; the Dutch East Indies and Australia and New Zealand took the largest quantities in 1927. South America, West Indies, and Asia furnished good markets for electrical slate and Mexico and South America for billiard-table slate. Small shipments of granules to Germany were reported.

Slate other than roofing exported from the United States, 1925–1927, by uses

Use	1925		1926		1927	
	Quantity	Value	Quantity	Value	Quantity	Value
School slates……cases[1]	11, 050	$111, 271	11, 210	$92, 165	8, 060	$76, 333
Electrical slate……square feet	[2] 36, 540	[2] 32, 333	51, 490	56, 042	25, 550	26, 916
Blackboards……do	149, 470	68, 086	125, 730	47, 520	142, 650	50, 120
Billiard tables……do	32, 180	16, 167	46, 730	37, 903	55, 350	37, 341
Structural……do	(2)	(2)	39, 870	20, 800	13, 200	9, 100
Slate granules……short tons	15, 550	100, 300	7, 620	46, 000	11, 360	67, 000
	----------	328, 157	----------	300, 430	----------	266, 810

[1] Cases weigh from 130 to 165 pounds each; average is 135 pounds.

[2] Small quantity of structural slate included with electrical.

REVIEW BY DISTRICTS

The active slate-producing districts of the United States are the Monson district of Maine; the New York-Vermont district, including Washington County, N. Y., and Rutland County, Vt.; the Lehigh district, including Lehigh and Northampton Counties, Pa.; the Peach Bottom district, including Lancaster and York Counties, Pa., and Harford County, Md.; Berks County, Pa.; and the Buckingham County (Arvonia) and Albemarle County districts of Virginia. These districts produce roofing slate and mill stock; some of them also produce roofing granules and slate flour. Roofing granules and flour were also produced in California, Georgia, and Tennessee in 1927.

Maine.—The slate produced in the Maine district is sold chiefly for electrical work. Smaller sales than in 1926 were reported for 1927. Lesser amounts of slate from this district are sold for roofing and for structural work. The producing companies in 1927 were the General Slate Co., The Monson Maine Slate Co., and the Portland-Monson Slate Co., all with plants at Monson.

New York-Vermont.—The New York-Vermont slate district is so continuous that it is sometimes difficult to determine from the reports of the producers to which State the product should be credited. These two States produce all of the colored slates used for roofing. Red slate is the chief product of the New York quarries, but they also produce, with those of Vermont, the various green, purple, variegated, mottled, and "freak" slates in demand for roofs.

The output of the New York quarries is chiefly for granules (red) with a small output for roofing slate and slabs for walk ways, flagging, etc. The principal producers of granules are the Advance Industrial

Supply Co. (address, 111 West Washington Boulevard, Chicago, Ill.) and the J. B. Preston Co. (Inc.) (address, 345 Madison Avenue, New York City), Granville; Staso Milling Co. (address, 332 South Michigan Avenue, Chicago, Ill.), Hampton; and the Sheldon Slate Products Co., Middle Granville, which also produces roofing slate. Other roofing-slate producers in New York are the Old English Slate Quarries (address, Glens Falls) and Searles Slate Co., Granville; G. H. Hopkins (address, Whitehall) and McDonough Slate Co., Middle Granville; and others who operate quarries intermittently and sell their product through dealers or other quarry operators.

The Vermont quarries produce roofing slate, mill stock, granules, and slate for walks, etc. The colors are in wide variety and combinations of green and purple and are generally classed as green, unfading green, unfading mottled green and purple, weathering green (sea-green), purple, variegated, and "freak." There are also black and gray varieties. Most of the granules manufactured are green. Much of the roofing slate produced in Vermont is, as in New York, quarried and shaped by owners of small quarries that are worked at irregular intervals. This slate is generally of unusual color and specially sized and is sold through operators of large quarries or through dealers. On account of the variety of colored slates found in the district much of the roofing slate commands a high price. Vermont produced over twenty times as much roofing slate as New York in 1927 and ranked next to Pennsylvania in quantity produced. There was an increase of 16 per cent in the quantity of roofing slate reported sold in Vermont in 1927 as compared with 1926. Slate for roofing and for mill stock used in structural and sanitary work, for electrical purposes, and in billiard-table tops is produced in Vermont, chiefly by the following firms, many small producers being omitted:

Castleton: The John Jones Slate Co.; mill stock.
Castleton and Poultney: The Penrhyn Slate Co. of Vermont (address, Hydeville); roofing, mill stock.
Fair Haven:
  S. Allen's Sons; roofing, mill stock.
  Harvey Bush Slate Co.; roofing.
  Clark-Flanagan (Inc.); roofing, mill stock.
  Durick, Keenan & Co. (Inc.); mill stock.
  Fairhaven Marble & Marbleized Slate Co.; mill stock.
  Hinchey Consolidated Slate Co. (successor to G. R. & J. F. Hinchey Slate Co. and General Slate Co.); roofing, mill stock.
  Hydeville Slate Works (address, Hydeville) (successor to Old English Slate Co.); mill stock.
Pawlet:
  O'Brien Bros. Slate Co. (Inc.) (address, Granville, N. Y.); roofing.
  Ondawa Slate Co. (address, Granville, N. Y.); roofing.
  Owen W. Owens & Sons (Inc.) (address, Granville, N. Y.); roofing.
  H. G. Williams (address, Granville, N. Y.); roofing.
Pawlet, Poultney, and Rupert: F. C. Sheldon Slate Co. (address, Granville, N. Y.); roofing.
Pawlet and Wells: Norton Bros. (address, Granville, N. Y.); roofing.
Poultney:
  The Auld & Conger Co. (address, 1920 East Seventy-Fifth Street, Cleveland, Ohio); roofing.
  Cambrian Slate Co. (address, Granville, N. Y.); roofing.
  Consolidated Slate Corporation of Vermont (successor to Wm. Griffith Slate Co. and New York Consolidated Slate Corporation); roofing.
  Mahar Bros. Slate Co. (Inc.) (address, Fair Haven); roofing, mill stock.
  New England Slate Co.; roofing.

Poultney and West Pawlet: Rising & Nelson Slate Co. (address, West Pawlet); roofing.
South Poultney: Owens & Jones (address, Poultney); roofing.
Wells:
  John D. Emack & Co. (address, 112 South Sixteenth Street, Philadelphia, Pa.); roofing.
  Evergreen Slate Co. (address, Granville, N. Y.); roofing.
  Mettowee Valley Slate Co. (address, Granville, N. Y.); roofing.
  Wm. Morris & Son (address, Granville, N. Y.); roofing.
  Williams Bros. (address, Middle Granville, N. Y.); roofing.
West Pawlet:
  Hughes & Edwards; roofing.
  Jones & Roberts; roofing.
  Patrick Kehoe; roofing.
  Griffith T. Roberts Estate; roofing.

Nearly all of the firms in Vermont that produce mill stock also sell slabs for flagstones, stepping-stones, etc. Vermont produces the greater part of this class of slate. Slate granules and slate flour are produced at Castleton by the Staso Milling Co. (address, 332 South Michigan Avenue, Chicago, Ill.).

Maryland-Pennsylvania.—Production in the Peach Bottom district in Maryland and Pennsylvania was confined to roofing slate and granules in Harford County, Md., and granules in York County, Pa.

Slate for roofing was quarried in Maryland in 1927 at Cardiff, Harford County, by the Peach Bottom Slate Co. of Harford County (address, Delta, Pa.) and the Peerless Slate Co. (address, Century Building, Pittsburgh, Pa.). The Peerless Slate Co. also produces a small amount of mill stock for structural and sanitary uses. The Staso Milling Co. (address, 332 South Michigan Avenue, Chicago, Ill.) operates a plant for the production of slate granules and flour at Whiteford, Harford County. The granules from York County, Pa., were produced by The Funkhouser Co. (successor to the Blue Mountain Stone Co.) (address, Hagerstown, Md.) near Delta.

Pennsylvania is the largest producer of slate (exclusive of slate granules) in the United States and also produces a greater variety of slate products than any other State, although Maine and Vermont both outrank it in output of electrical slate. The total value of the slate sold in Pennsylvania by the producers in 1927 was 12 per cent less than in 1926. In 1927 there was a decrease of 5 per cent in the mill stock sold in Pennsylvania for structural and sanitary purposes (including slate sold for vaults and covers). The quantity of slate sold for electrical use was 30 per cent less than in 1926. Slate sold for tops of billiard tables increased 9 per cent in quantity. Slate sold for blackboards and bulletin boards and for school slates decreased. Sales of roofing slate declined 6 per cent in quantity and 8 per cent in value. "Flour" produced in Berks, Northampton, and York Counties showed a decrease of 10 per cent in quantity sold.

The sales of slate by producers in Pennsylvania, by counties and uses, in 1927 were as follows:

Slate sold by producers in Pennsylvania in 1927, by counties and uses

County	Operators	Roofing slate		Mill stock			
				Structural and sanitary [1]		Electrical	
		Squares (100 square feet)	Value	Square feet	Value	Square feet	Value
Berks, Northampton,[2] and York	4	----------	----------	----------	----------	----------	----------
Lehigh	9	20, 920	$149, 892	96, 550	$41, 432	233, 350	$130, 380
Northampton	27	226, 200	1, 803, 184	2, 608, 480	882, 456	109, 700	98, 179
	40	247, 120	1, 953, 076	2, 705, 030	923, 888	343, 050	228, 559
Total, 1926	43	263, 668	2, 127, 782	2, 848, 000	997, 108	488, 125	327, 447

County	Mill stock—Continued				Other [3]	Total value
	Blackboards and bulletin boards		School slates			
	Square feet	Value	Square feet	Value		
Berks, Northampton,[2] and York	----------	----------	----------	----------	$404, 385	$404, 385
Lehigh	736, 490	$162, 338	756, 480	$19, 257	----------	503, 299
Northampton	2, 999, 380	954, 260	24, 100	741	[4] 122, 928	[4] 3, 861, 748
	3, 735, 870	1, 116, 598	780, 580	19, 998	527, 313	4, 769, 432
Total, 1926	3, 998, 653	1, 356, 300	973, 767	32, 886	571, 654	5, 413, 177

[1] Includes slate for grave covers and vaults.

[2] For roofing granules and "flour."

[3] In 1926 includes 337,430 square feet of billiard-table material, valued at $128,441, and 64,770 short tons of granules and "flour," valued at $441,647; in 1927 includes 367,650 square feet of billiard-table material, valued at $120,762, and 58,480 tons of granules and "flour," valued at $404,385.

[4] Exclusive of value of roofing granules and "flour," which is included in first entry above.

The principal slate-quarry operators in Pennsylvania and the classes of slate produced by them are as follows:

Berks County: Lenhartsville—Greenwich Manufacturing Co.; slate "flour."

The Lehigh district, which includes Lehigh and Northampton Counties, now produces all of the roofing slate and all of the mill stock sold in the State.

Lehigh County: All the slate companies operating in Lehigh County produce both roofing and mill stock. The quarries are in the vicinity of Emerald, Slatedale, and Slatington. The producing companies in 1927 and their addresses were as follows: J. P. Kern Slate Co., Royal Blue Slate Co., and Shenton Slate Co., Slatedale; American Slate Quarries, Blue Mountain Slate Manufacturing Co., Blue Ridge Quarries (Inc.), Cambridge Slate Co., Manhattan Slate Co., and Slatington Slate Co., Slatington.

Northampton County: The quarry operators and their product in Northampton County in 1927 were as follows:

Bangor:
- Bangor Ideal Slate Mining Co.; roofing.
- Bangor Quarry Co. (address, 1920 East Seventy-fifth Street, Cleveland, Ohio); roofing, mill stock.
- Bangorvein Slate Co.; roofing, mill stock.

Bangor—Continued.
  Bangor Washington Slate Co.; roofing.
  Columbia Bangor Slate Co.; roofing.
  North Bangor Slate Co.; roofing, mill stock.
  Old Bangor Slate Co.; roofing.
  Slate Products Co. (Inc.); roofing, mill stock.
Berlinsville: Amalgamated Slate Quarries Co. (address, Easton); Genuine Washington quarries; roofing, mill stock.
Chapman Quarries: Chapman Slate Co. (address, Bethlehem); roofing.
East Bangor: East Bangor Consolidated Slate Co.; roofing, mill stock.
Edelman: The Hard-Vein Slate Co. (address, Easton); roofing.
Pen Argyl:
  Albion Vein Slate Co. (address, Bangor); roofing.
  Belmont Slate Co. (address, Bangor); roofing, mill stock.
  Diamond Slate Co. (Inc.); mill stock.
  Doney Slate Co. (Inc.); roofing, mill stock.
  Jackson-Bangor Slate Co.; roofing, mill stock.
  Keenan Structural Slate Co. (address, Bangor); roofing, mill stock.
  Parsons Bros. Manufacturing Co.; slate "flour."
  Parsons Bros. Slate Co.; roofing, mill stock.
  Stephens-Jackson Co.; roofing, mill stock.
  D. Stoddard & Son (address, Bangor); mill stock.
West Bangor: Bangor Fidelity Slate Co. (address, Bangor); roofing, mill stock.
Windgap:
  Bolger-Heller Slate Co.; roofing, mill stock.
  Colonial Slate Co. (address, Bangor); roofing, mill stock.
  Imperial Slate Blackboard Co.; roofing, mill stock.
  Phoenix Slate Co.; roofing, mill stock.
  M. L. Tinsman & Co. (address, Easton); roofing, mill stock.

Virginia.—The slate quarried for roofing in Virginia is from Buckingham County and is quarried by the Le Sueur-Richmond Slate Corporation and the Pierce Slate Co., Ore Bank, and the Arvonia-Buckingham Slate Co. (Inc.) (address, Merchants National Bank, Richmond) and the Williams Slate Co. (Inc.), Arvonia. Black and green slate granules are produced by the Blue Ridge Slate Corporation (address, Charlottesville) at Esmont, Albemarle County.

Other States.—Nothing was done in the Arkansas quarries in 1927 on account of floods.

The only slate reported from California in 1927 was slate granules produced by the Commercial Minerals Co. (address, Holbrook Building, San Francisco) from a quarry near Placerville, Eldorado County.

In Georgia, The Funkhouser Co. (address, Hagerstown, Md.) succeeded the Richardson Co. and started producing green granules and flour at Fairmount, Bartow County. There were no sales from the Rockmart quarries in 1927.

The green slate deposit at Tellico Plains, Monroe County, Tenn., was operated in 1927 for granules by The Funkhouser Co. (address, Hagerstown, Md.), successor to the Tennessee Rock Products Co.

SHIPMENTS

The localization of slate deposits in the most thickly populated part of the United States makes transportation to markets in other areas where cities and towns are growing up a matter of considerable importance to the slate trade. Transportation and freight rates have long been a retarding factor in the slate industry. The total quantity of slate quarried annually is small compared with that of many other mineral products, and no one company has a large output. To facilitate marketing the large quarry companies and joint selling agencies act as distributors for many of the quarries as well as buyers for the slate trade. As a result, many quarry operators have no record of the ultimate destination of their slate. Others refuse to take the trouble to compile the statements which necessarily take time but would seem to be of material value in finding new markets for their slate and in keeping track of fluctuations in their regular markets. Still others object to giving the figures for fear of revealing their market.

The statistics collected by the Bureau of Mines are obtained primarily from the quarrymen rather than from the dealers and jobbers, and the figures showing the distribution of the sales of slate have not been satisfactory. Dealers have, however, cooperated with the Bureau of Mines by furnishing statements of the distribution of their sales for 1927. In New York and Vermont the larger producing companies as well as jobbers and dealers act as distributing agents.

The general trend of shipments of slate products by destination territories, however, is shown in the following table of shipments, the incompleteness of which is largely due to the disinclination of some of the largest producers to supply this information.

Distribution of slate products in 1927, by destinations

Destination	Roofing (squares)	Structural and sanitary (square feet)	Electrical (square feet)	Vaults and covers (square feet)	Blackboards and bulletin boards (square feet)	Billiard-table tops (square feet)	Floors and walks (square feet)	Granules and "flour" (short tons)
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	25, 400	240, 000	169, 000	95, 000	196, 000	3, 000	57, 000	37, 000
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	190, 000	1, 040, 000	378, 000	307, 000	944, 000	269, 000	219, 000	140, 000
Illinois, Indiana, Michigan, Ohio	39, 000	200, 000	170, 000	42, 000	672, 000	126, 000	129, 000	193, 000
Florida, Georgia, North Carolina, South Carolina, Virginia	11, 000	37, 000	600	36, 000	150, 000	---------	4, 000	23, 000
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	20, 000	39, 000	9, 000	300	123, 000	---------	3, 000	12, 500
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	17, 000	59, 000	49, 000	5, 000	457, 000	18, 000	1, 300	13, 000
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	4, 000	11, 000	8, 000	---------	222, 000	150	13, 000	11, 000
Total distribution reported	306, 400	1, 626, 000	783, 600	485, 300	2, 764, 000	416, 150	426, 300	429, 500
Total sales	468, 560	2, 420, 730	1, 417, 060	530, 740	3, 735, 870	402, 700	726, 300	459, 760

This table shows distribution of from 55 to over 90 per cent of the various slate products. The Middle Atlantic States are credited with the consumption of about 32 to 64 per cent of the material shipped. It is thought, however, that reshipments for which no figures are available would indicate a smaller market in that territory and a commensurably larger one in the other markets, especially those covered by Illinois, Indiana, Michigan, and Ohio, the South Atlantic States, and the Central States.

ABRASIVE MATERIALS [1]

INTRODUCTION

The production of natural abrasive materials is a varied industry in which a considerable number of widely scattered dissimilar enterprises are engaged in placing different commodities on the markets. By present-day standards in mining and manufacturing few, if any, of these enterprises would be considered large. Nevertheless, individually as well as collectively, they are important elements in the industrial life of the country, inasmuch as they supply tools for grinding, polishing, and other abrasive operations and the ingredients of cleansing compounds, without which the great wood, leather, and metal working and other industries and many householders would be put to great expense and inconvenience in the use of substitutes.

This chapter considers mineral products which as such or as essential constituents of manufactured products are used as abrasive materials. Some of these mineral products are used in other ways also—for example, tripoli as a filler and diatomite for thermal insulation. With these minerals segregation of production according to uses is difficult, but the total production for all uses is shown in this report. Feldspar and quartz, both of which are used as abrasives, are excluded from this report because that is not their principal use and because precise separation of the statistics according to uses is impossible. Therefore they are considered in other chapters of Mineral Resources, entitled "Feldspar" and "Silica."

Statistics on artificial abrasives are included for comparison and because of their strong influence on the marketing of natural abrasives.

NATURAL ABRASIVES

Under the head of natural abrasives in this report are included millstones and related quarry products, such as chasers, dragstones, and paving stone for chaser mills; grindstones and pulpstones; oilstones and other whetstones, hones, scythestones, and rubbing stones; corundum and emery; abrasive garnet; tripoli; diatomite (diatomaceous earth); pumice; and pebbles and lining for tube mills. These natural abrasives were produced in 1927 in 28 States, as follows:

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[1] Figures on production compiled by Miss A. T. Coons and Miss B. H. Stoddard, of the Bureau of Mines. Data on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Arizona	Pumice.
Arkansas	Oilstones.
California	Diatomite, grinding pebbles, and pumice.
Idaho	Diatomite.
Illinois	Tripoli.
Indiana	Rubbing stones, scythestones, and whetstones.
Kansas	Pumice.
Maryland	Diatomite.
Michigan	Grindstones.
Minnesota	Grinding pebbles and tube-mill lining.
Missouri	Tripoli.
Nebraska	Pumice.
Nevada	Diatomite.
New Hampshire	Diatomite, garnet, millstones, and scythestones.
New Mexico	Pumice.
New York	Diatomite, emery, garnet, and millstones.
North Carolina	Millstones.
Ohio	Grindstones, pulpstones, rubbing stones, scythestones, and whetstones.
Oklahoma	Tripoli.
Oregon	Diatomite.
Pennsylvania	Rottenstone.
South Dakota	Tube-mill lining.
Tennessee	Tripoli.
Utah	Diatomite.
Vermont	Scythestones.
Virginia	Emery and millstones.
Washington	Diatomite, pulpstones, and rubbing stones.
West Virginia	Grindstones and pulpstones.

MILLSTONES

The value of the millstones or burrstones and related quarry products—chasers, dragstones, and pavers—sold by producers in the United States in 1927 was $35,438, a decrease of 23 per cent from 1926. During the past seven years Ulster County, N. Y., has been the principal source of output, and the largest number of producers reported from that region.

American millstones have been and are still for the most part made of quartz sandstone and conglomerate, chiefly in Ulster County, N. Y., and Montgomery County, Va., but also in Pennsylvania. Millstones are also made of granite, particularly in Alabama, Maine, Minnesota, New Hampshire, and North Carolina. The production recorded in Mineral Resources includes only the stones made for other than purely local use. Doubtless a large number of stones have been made in many unrecorded localities as local use has required, and they have been made of other rocks than those specified, particularly in the mountain sections of the Southern States. Formerly the millstone manufacturing industry was much larger than at present. About 1880 the total value of the stones produced and sold in the United States was around $200,000 annually. The production has declined since the late eighties and during the last seven years has been less than $50,000 worth of stones annually. The decline is due in part to the fact that the manufacture of millstones is a handcraft in which, as in many others in the United States, the old master craftsmen, who are gradually disappearing, are not being replaced. In part, also, the change is due to new processes in the grain, paint, and mineral milling industries in which the old-style burrstones and chaser mills are being supplanted by grinding equipment of an entirely different type.

Value of millstones, chasers, and dragstones sold by producers in the United States, 1918–1927

Year	New York		Other States [1]		Total	
	Producers	Value	Producers	Value	Producers	Value
1918	14	$25,488	13	$67,026	27	$92,514
1919	7	10,155	11	56,817	18	66,972
1920	8	13,331	11	49,994	19	63,325
1921	12	14,672	7	9,852	19	24,524
1922	12	17,025	4	3,828	16	20,853
1923	17	14,344	4	7,885	21	22,229
1924	17	18,215	5	11,910	22	30,125
1925	13	14,063	5	8,427	18	22,490
1926	12	23,629	7	22,308	19	45,937
1927	12	26,015	5	9,423	17	35,438

[1] 1918: Maryland, North Carolina, Pennsylvania, and Virginia; 1919: Alabama, North Carolina, Pennsylvania, and Virginia; 1920: Alabama, Maryland, North Carolina, and Virginia; 1921: Alabama, New Hampshire, North Carolina, and Virginia; 1922: Alabama, North Carolina, and Virginia; 1923: Maine, Minnesota, North Carolina, and Virginia; 1924–1927: New Hampshire, North Carolina, and Virginia.

GRINDSTONES AND PULPSTONES

Grindstones and pulpstones are made from sandstone quarried in northeastern and eastern Ohio, western West Virginia, eastern Michigan, and Pierce County, Wash. In 1927 there was a decrease of 17 per cent in the total quantity of grindstones and pulpstones sold by producers as compared with 1926. The total value of such stones in 1927 was $1,554,750.

Grindstones and pulpstones sold by producers in the United States, 1918–1927

Year	Grindstones		Pulpstones		
	Short tons	Value	Pieces	Short tons	Value
1918	56,554	$1,262,602	2,921	8,785	$513,680
1919	40,755	993,959	2,450	6,110	342,056
1920	44,832	1,239,990	2,321	8,652	467,014
1921	16,310	477,259	2,941	10,030	750,063
1922	21,367	574,900	[1] 1,619	[1] 5,157	[1] 445,286
1923	37,384	1,008,899	2,533	9,186	680,416
1924	28,991	852,260	2,660	9,193	814,409
1925	28,970	864,637	2,530	8,370	841,302
1926	28,669	875,240	2,804	9,670	997,994
1927	23,222	633,207	2,707	8,709	921,543

[1] Exclusive of sales in Washington prior to 1923.

OILSTONES AND SCYTHESTONES

Natural stone or quarry products used as abrasive material include, besides the millstones, grindstones, and pulpstones above considered, oilstones and other whetstones, hones, rubbing stones, and scythestones. These are cut or otherwise shaped, usually in small pieces, in a great variety of forms for the special uses indicated by their names. Oilstones are produced in the United States from novaculite quarried in Arkansas; other whetstones chiefly from sandstone quarried in Indiana and Ohio; scythestones from sandstone quarried in Indiana and Ohio and from schist quarried in New Hampshire and Vermont; and rubbing stones from sandstone quarried in Indiana, Ohio, and Washington. In earlier years a small production of hones was made from sandstone quarried in Kentucky, but no production has been reported since 1923. No whetstones were reported made from Kentucky sandstone in 1927.

The use of ironstone (iron carbonate) as a source of abrasive material was tried out in 1927. Finishing hones made of this material were found to be satisfactory, and plans were carried forward for the development of a plant in Alcorn County, near Blue Mountain, Miss.

Oilstones and other whetstones, hones, scythestones, and rubbing stones sold by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	1,010	$189,033	1923	1,223	$231,812
1919	1,463	235,943	1924	1,056	258,943
1920	1,144	231,747	1925	970	272,224
1921	831	173,025	1926	1,680	223,359
1922	1,016	197,450	1927	1,048	233,545

CORUNDUM AND EMERY

No production of corundum in the United States has been reported since 1918. Emery was produced for sale in 1927 from the Peekskill region, New York, and from the deposits in Pittsylvania County, Va. Deposits in other localities have either been exhausted or, under present conditions, can not meet the competition of emery from New York, Greece, and Turkey.

Emery sold or used by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	[1] 10,422	[1] $112,878	1923	2,286	$29,478
1919	2,601	23,203	1924	2,195	19,756
1920	2,327	21,685	1925	769	5,907
1921	305	2,250	1926	386	3,641
1922	1,468	17,511	1927	506	5,855

[1] Includes corundum, for which figures may not be published.

GARNET

In 1927 the sales of abrasive garnet by producers in the United States amounted to 6,939 short tons, valued at $573,525. The average value of garnet mined in 1927 was close to $83 a ton, as compared with $82 in 1926, $85 in 1925, and $81 in 1924. The major part of the production was made in Warren County, N. Y., and the remainder in Merrimack County, N. H. Some New York garnet was sold at prices well above the average value cited.

Abrasive garnet sold or used by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	4,696	$248,161	1923	9,006	$688,437
1919	4,944	310,131	1924	8,290	674,176
1920	5,476	434,425	1925	8,429	712,853
1921	3,048	260,687	1926	6,397	523,875
1922	7,054	566,879	1927	6,939	573,525

TRIPOLI

The value of tripoli sold (including Pennsylvania "rottenstone") in 1927, as reported by producers, was $447,068. This value corresponds approximately to 26,000 short tons of material, of which about one-seventh was sold in the form of crude quarry products and some of which was sold for as little as $1 a ton. Most of the production, however, was sold in ground or otherwise prepared form by the producers at values ranging from $13 to $24 a ton.

The chief sources of production in 1927, as in previous years, were a small area lying in Newton County, Mo., and Ottawa County, Okla., and the Alexander-Union County area in southern Illinois. An appreciable output was also reported from Tennessee, and the output of rottenstone in Lycoming County, Pa., is also included in the figures here presented.

Some of the Missouri-Oklahoma tripoli is produced primarily for use as an abrasive, and some of it is mined to be worked up into filter blocks, the cuttings and waste from the making of which are ground and prepared for abrasive and other uses. The larger part of the Missouri output is used as filler, for foundry facings, and in many other ways. The Illinois product is generally known simply as "silica," and though used to some extent as an abrasive for metal polishes, in soaps, and in cleansers, it is very largely used in paint and fillers, in making glass, in the body and enamel of ceramic wares, and for facing foundry molds.

It is not possible to determine the amounts of tripoli used as abrasive material and otherwise, nor to obtain from the producers uniform reports on the quantity and value of the crude or rough quarried material, as they sell much of the product originally in some manufactured or prepared form. Statistics herein reported and in earlier chapters of Mineral Resources therefore do not permit satisfactory comparison between years or between producing States. In the following table the value for the total output of crude tripoli is in part an arbitrarily assigned value, inasmuch as a large part of the output is not sold crude but in ground or other prepared form by the original producers. The values given "as sold" are the total realizations as reported by producers and include receipts from sales of both crude and ground or otherwise finished material.

Tripoli (including Pennsylvania rottenstone) sold or used by producers in the United States, 1918–1927

Year	Illinois			Other States [1]			Total		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Crude (estimated)	As sold (crude and finished)		Crude (estimated)	As sold (crude and finished)		Crude (estimated)	As sold (crude and finished)
1918	12,004	$18,902	$100,126	7,978	$34,913	$99,728	19,982	$53,815	$199,854
1919	13,014	32,961	116,492	11,278	65,049	65,049	24,292	98,010	181,541
1920	24,458	66,509	360,651	15,775	97,567	209,026	40,233	164,076	569,677
1921	7,765	27,333	125,352	4,575	26,559	87,661	12,340	53,892	213,013
1922	18,747	54,741	194,371	11,458	50,568	122,357	30,205	105,309	316,728
1923	11,522	31,230	117,201	15,560	30,960	265,556	27,082	62,190	382,757
1924	13,466	23,566	116,188	15,010	31,971	273,221	28,476	55,537	389,409
1925	11,809	27,480	143,859	17,579	31,290	291,027	29,388	58,770	434,886
1926	11,948	29,870	192,483	19,421	35,152	331,126	31,369	65,022	523,609
1927	(2)	(2)	(2)	(2)	(2)	(2)	26,099	66,452	447,068

[1] 1918–1923: Missouri, Oklahoma, and Pennsylvania; 1924–1927: Missouri, Oklahoma, Pennsylvania, and Tennessee.

[2] Bureau of Mines not at liberty to publish figures.

DIATOMITE

As usual, the chief source of production of diatomite in 1927 was California, but sales were also reported from Oregon, Nevada, Idaho, Utah, Maryland, New York, Washington, and New Hampshire. So large a proportion of the total production and sales in 1927 was made by one California company, which objects to the disclosure of its figures, that the Bureau of Mines is not at liberty to publish the figures for diatomite produced and sold in the United States in 1927.

Diatomite sold or used by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918 [1]	2,965	$24,947	1923	65,833	$699,406
1919	42,642	531,960	1924	63,163	693,917
1920	61,922	1,079,693	1925	73,030	922,281
1921	[2] 55,134	[2] 682,616	1926	[2] 87,126	[2] 1,081,564
1922	44,761	386,669	1927	(3)	(3)

[1] Exclusive of considerable production for special uses upon which the Bureau of Mines is not at liberty to report.

[2] Partly estimated.

[3] Bureau of Mines not at liberty to publish figures.

PUMICE

Production of pumice in the United States in 1927 was reported from Yuma County, Ariz.; Imperial and Inyo Counties, Calif.; Harper, Haskell, Meade, and Norton Counties, Kans.; Lincoln County, Nebr.; and Valencia County, N. Mex. The California output was largely lump pumice. In Kansas and Nebraska the pumice was dug from beds of fragmental volcanic glass or so-called ash. The total quantity sold or used by producers in 1927 was 53,298 short tons, valued at $221,481.

Pumice sold or used by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	30,637	$91,178	1923	56,575	$214,169
1919	36,051	116,835	1924	43,651	190,253
1920	41,838	114,433	1925	40,380	179,020
1921	37,108	158,540	1926	53,887	208,504
1922	45,262	175,600	1927	53,298	221,481

PEBBLES FOR GRINDING AND FLINT LINING FOR TUBE MILLS

The commercial production of pebbles used for grinding minerals, ores, cement, and for other purposes, together with the output of quartzite blocks for use as tube-mill liners, includes, so far as known to the Bureau of Mines, only the output of beach pebbles in southern California and of cut cubes and artificially rounded pebbles and cut liners made of quartzite in Minnesota and South Dakota. The figures in the following table appear to cover the entire commercial output, but doubtless there was unrecorded additional production for local or own use by other companies than those reporting.

Pebbles for grinding and flint lining for tube mills sold or used by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	12,469	$129,485	1923	4,551	$51,795
1919	9,448	85,302	1924	2,532	37,429
1920	10,924	77,823	1925	3,831	50,147
1921	989	14,637	1926	6,219	85,146
1922	3,159	30,798	1927	3,342	46,856

IMPORTS AND EXPORTS

Value of abrasive materials imported for consumption in the United States, 1923–1927

Material	1923	1924	1925	1926	1927
Millstones and burrstones	$20,102	$6,311	$8,413	$6,266	$12,726
Grindstones	106,028	122,440	124,319	120,335	134,804
Hones, oilstones, and whetstones	53,233	43,579	49,108	63,152	67,368
Emery and corundum	722,688	364,755	313,718	616,700	264,613
Garnet	93,803	54,402	200	---------	---------
Diatomaceous earth, tripoli, and rottenstone	11,779	9,504	6,589	14,544	15,403
Pumice	128,693	111,284	130,460	129,449	124,074
Diamond dust and bort	228,409	259,482	760,476	271,382	62,045
Flint, flints, and flint stones, unground	130,974	114,958	105,041	120,078	93,658

Abrasive materials imported for consumption in the United States, 1926–27, by kinds

Kind	1926		1927	
	Quantity	Value	Quantity	Value
Millstones and burrstones:				
Rough or unmanufactured ... short tons	102	$5,035	161	$11,631
Bound up into millstones ... do	50	1,231	22	1,095
Grindstones, finished or unfinished ... do	2,253	120,335	2,001	134,804
Hones, oilstones, and whetstones ... do	544	63,152	584	67,368
Emery:				
Ore ... do	4,745	182,977	4,612	71,233
Grains, ground, pulverized, or refined ... pounds	(1)	(1)	(1)	(1)
Paper and cloth of emery or corundum ... do	562,419	86,698	(2)	52,147
Wheels, files, and other manufactures of which emery or corundum is the material of chief value ... pounds	57,271	31,899	94,999	51,600
Corundum (see also "Emery"):				
Ore ... short tons	5,411	302,180	1,269	70,038
Grains, ground, pulverized, or refined ... pounds	[1] 305,779	[1] 12,946	[1] 230,694	[1] 19,595
Diatomaceous earth, tripoli, and rottenstone ... short tons	1,033	14,544	1,338	15,403
Pumice:				
Crude or unmanufactured ... do	9,589	90,886	8,929	90,374
Manufactures of, or of which pumice is the component material of chief value ... short tons	(3)	38,563	(3)	33,700
Diamond:				
Bort ... carats	17,690	207,966	1,747	33,786
Dust ... pounds	(3)	63,416	(3)	28,259
Flint, flints, and flint stones, unground ... short tons	15,091	120,078	15,191	93,658
	---------	1,341,906	---------	774,691

[1] Emery included with corundum; not separately classified.
[2] 13,956 reams; weight not recorded.
[3] Quantity not recorded.

Value of domestic abrasive materials exported from the United States, 1923–1927

Material	1923	1924	1925	1926	1927
Grindstones	$499,123	$481,397	$553,750	$629,748	$578,113
Abrasive wheels, emery, and other	571,733	521,840	439,904	248,631	240,027
All other natural abrasives, hones, whetstones, etc.	342,737	173,731	195,915	323,447	419,088

ARTIFICIAL ABRASIVES

The table that follows gives the production of silicon carbide, aluminum oxide, and steel shot or crushed steel grains. These materials compete with the natural abrasives used as grains—for example, emery, corundum, and garnet. The figures represent the total output of crude materials or first product of the manufacturing plants, not all of which is used as abrasive material; in fact, a large but undetermined part of the silicon carbide and aluminum oxide output is not so used. The total output is shown here without separation of the products according to the uses to which they are put, because it is thought that the proportion used as abrasive material has not fluctuated so widely in recent years as to destroy the value of these figures for comparison with the statistics of natural abrasives.

Crude artificial abrasives, sold, shipped, or used, from manufacturing plants in the United States and Canada, 1918–1927

Year	Silicon carbide		Aluminum oxide		Metallic abrasives		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1918	10,047	$1,518,600	35,716	$5,741,270	5,150	$422,727	50,913	$7,682,597
1919	28,435	3,380,151	19,723	3,811,498	2,360	274,200	50,518	7,465,849
1920	6,887	1,309,605	32,891	5,956,639	2,659	225,920	42,437	7,492,164
1921	2,707	475,336	7,325	1,318,771	3,167	202,040	13,199	1,996,147
1922	16,233	2,022,613	31,898	3,246,714	5,804	421,148	53,935	5,690,475
1923	21,149	2,786,929	51,391	5,378,926	8,229	612,140	80,769	8,777,995
1924	17,792	2,161,498	33,708	3,482,577	8,597	569,665	60,097	6,213,740
1925	24,112	2,493,756	53,253	4,714,562	11,165	780,612	88,530	7,988,930
1926	17,026	1,702,037	43,967	4,106,699	12,610	942,429	73,603	6,751,165
1927	26,289	2,603,571	50,973	4,516,637	13,364	839,683	90,626	7,959,891

SALT, BROMINE, AND CALCIUM CHLORIDE

By A. T. COONS[1]

SALT

PRODUCTION

The quantity of salt produced for sale or use by operators of salt mines, wells, and ponds in the United States in 1927 was 3 per cent more than in 1926. The value decreased 1 per cent as compared with 1926. Sales of rock salt, including pressed blocks from rock salt, were slightly more in 1927 than in 1926, and sales of evaporated salt, including pressed blocks from evaporated salt, increased 3 per cent. The salt content of brine produced and used by producers for the manufacture of chemicals was 4 per cent more than for 1926. In 1927, as in 1926 and 1925, the salt industry was characterized by keen competition, a tendency to overproduction, and a lowering of prices that resulted in the closing down of small plants or their absorption by larger operators. Several of the larger manufacturers have plants in more than one district and can supply their markets from the nearest plant, thereby reducing freight costs.

The average value of all salt in 1927 was $3.28 a short ton—12 cents less than in 1926. The average value of evaporated salt, including pressed blocks from evaporated salt, was $7.33, or 2 cents more than in 1926. The average value of rock salt sold, including pressed blocks from rock salt, was $2.97—42 cents less than in 1926. There were 87 plants reporting operations in 1927 as compared with 92 in 1926.

Salt sold or used by producers in the United States, 1918–1927

Year	Short tons				Value [a]	
	Manufactured (evaporated)	In brine	Rock salt	Total	Total	Average
1918	2, 724, 203	2, 830, 600	1, 683, 941	7, 238, 744	$26, 940, 361	$3. 72
1919	2, 392, 290	2, 850, 639	1, 639, 973	6, 882, 902	27, 074, 694	3. 93
1920	2, 409, 924	2, 819, 916	1, 610, 189	6, 840, 029	29, 894, 075	4. 37
1921	1, 931, 243	1, 577, 335	1, 472, 576	4, 981, 154	24, 557, 966	4. 93
1922	2, 276, 683	2, 569, 042	1, 947, 124	6, 792, 849	27, 464, 838	4. 04
1923	2, 239, 872	2, 787, 239	2, 103, 602	7, 130, 713	27, 795, 941	3. 90
1924	2, 224, 555	2, 513, 853	2, 064, 707	6, 803, 115	25, 747, 048	3. 78
1925	2, 235, 170	2, 819, 690	2, 342, 640	7, 397, 500	26, 162, 361	3. 54
1926	2, 198, 060	3, 037, 820	2, 135, 720	7, 371, 600	25, 055, 012	3. 40
1927	2, 263, 030	3, 161, 800	2, 143, 860	7, 568, 690	24, 817, 962	3. 28

[a] The values are f. o. b. mine or refinery and do not include cost of cooperage or containers.

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[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Salt sold or used by producers in the United States, 1924–1927, by States

State	1924		1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
California	268,112	$1,361,166	292,480	$1,420,924	288,440	$1,397,587	300,880	$1,827,750
Idaho	33	350	(1)	(1)	(1)	(1)	----------	----------
Kansas	794,303	2,781,217	812,540	2,494,423	729,880	2,741,534	794,780	2,971,544
Louisiana	383,104	2,182,797	500,350	2,218,265	520,400	2,457,875	606,110	2,167,220
Michigan	1,918,463	7,864,838	2,172,600	7,710,331	2,260,320	7,594,418	2,271,460	7,551,552
New Mexico	1,700	17,000	(1)	(1)	(1)	(1)	(1)	(1)
New York	1,972,808	6,739,597	2,053,970	7,133,244	2,001,580	6,564,829	1,964,080	6,121,461
Ohio	1,102,214	3,641,585	1,173,590	4,116,625	1,164,400	3,209,473	1,203,170	3,130,236
Porto Rico	14,466	29,932	12,060	28,751	10,480	19,182	15,150	28,920
Texas	(1)	(1)	(1)	(1)	(1)	(1)	54,270	399,171
Utah	78,577	463,143	88,150	432,846	77,350	422,317	74,690	334,732
West Virginia	37,561	258,089	25,870	180,053	23,180	170,953	22,600	167,155
Undistributed [2]	231,774	407,334	265,890	426,899	295,570	476,844	261,500	118,221
	6,803,115	25,747,048	7,397,500	26,162,361	7,371,600	25,055,012	7,568,690	24,817,962

[1] Included under "Undistributed."

[2] 1924, Texas and Virginia; 1925, Idaho, Nevada, New Mexico, Texas, and Virginia; 1926, Idaho, Nevada, New Mexico, Oklahoma, Texas, and Virginia; 1927, Arizona, Nevada, New Mexico, Oklahoma, and Virginia.

All important producing States except New York showed increases in output in 1927.

Salt sold or used by producers in the United States, 1926–27, by methods of manufacture

Method of manufacture	1926		1927	
	Short tons	Value	Short tons	Value
Evaporated in open pans or grainers	693,140	$6,166,677	703,970	$6,153,314
Evaporated in vacuum pans [1]	1,055,310	7,557,418	1,097,390	7,873,998
Solar evaporated	323,940	1,301,942	311,530	1,308,693
Pressed blocks from evaporated salt	125,670	1,038,292	150,140	1,251,022
Rock	2,106,850	7,038,343	2,109,440	6,146,307
Pressed blocks from rock salt	28,870	196,414	34,420	230,048
Salt in brine (sold or used as such)	3,037,820	1,755,926	3,161,800	1,854,580
	7,371,600	25,055,012	7,568,690	24,817,962

[1] Including salt manufactured by the spray system of cooling.

New York, Louisiana, Kansas, and Michigan produced more than 99 per cent of the rock salt reported in 1927.

Rock salt sold by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	1,683,941	$5,684,661	1923	[1] 2,103,602	[1] $7,843,419
1919	1,639,973	6,224,920	1924	[1] 2,064,707	[1] 7,501,419
1920	[1] 1,610,189	[1] 7,048,315	1925	[1] 2,342,640	[1] 7,444,799
1921	[1] 1,472,576	[1] 6,693,923	1926	[1] 2,135,720	[1] 7,234,757
1922	[1] 1,947,124	[1] 7,489,644	1927	[1] 2,143,860	[1] 6,376,355

[1] Includes pressed blocks made of rock salt, as follows: 1920, 15,182 tons, valued at $172,211; 1921, 20,148 tons, valued at $169,244; 1922, 38,593 tons, valued at $245,174; 1923, 38,043 tons, valued at $281,302; 1924, 36,624 tons, valued at $263,260; 1925, 35,730 tons, valued at $206,818; 1926, 28,870 tons, valued at $196,414; 1927, 34,420 tons, valued at $230,048.

Evaporated salt sold or used by producers in the United States, 1926–27, by States

State	1926		1927	
	Short tons	Value	Short tons	Value
California	272, 440	$1, 333, 587	284, 520	$1, 762, 330
Kansas	236, 710	1, 887, 679	272, 680	1, 964, 431
Michigan	828, 000	6, 287, 339	804, 020	6, 366, 279
New York	385, 810	3, 127, 155	415, 330	3, 271, 745
Ohio	287, 400	2, 332, 473	309, 170	2, 236, 236
Porto Rico	10, 480	19, 182	15, 150	28, 920
Texas	(1)	(1)	54, 270	399, 171
Utah	74, 540	410, 962	(1)	(1)
West Virginia	23, 180	170, 953	22, 600	167, 155
Undistributed [2]	79, 500	494, 999	85, 290	390, 760
	2, 198, 060	16, 064, 329	2, 263, 030	16, 587, 027

[1] Included under "Undistributed."

[2] 1926, Idaho, Louisiana, Nevada, New Mexico, Oklahoma, and Texas; 1927, Louisiana, Nevada, New Mexico, Oklahoma, and Utah.

Sales of pressed blocks from both evaporated salt and rock salt reported by salt producers increased 19 per cent in 1927. The production of these blocks from both evaporated salt and rock salt, as reported by the original producers of the salt and shown in the following table, does not represent the entire pressed-block industry because some firms that do not produce salt are making pressed blocks from salt bought in the open market. Pressed blocks from evaporated salt are made chiefly by salt producers in Kansas and Michigan but are produced also in Texas, Utah, Ohio, and California. Pressed blocks from rock salt are made by salt producers in Louisiana, Michigan, and New York.

In 1927 the average value of pressed blocks from evaporated salt was $8.33 a ton; the average value of the blocks made from rock salt was $6.68.

Pressed salt blocks sold by original producers of the salt in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	94, 150	$939, 900	1923	166, 116	$1, 544, 548
1919	119, 510	1, 358, 757	1924	172, 344	1, 322, 744
1920	129, 224	1, 515, 041	1925	171, 210	1, 276, 503
1921	117, 739	1, 275, 483	1926	154, 540	1, 234, 706
1922	172, 682	1, 554, 429	1927	184, 560	1, 481, 070

IMPORTS AND EXPORTS

Salt imported for consumption in the United States, 1918–1927

Year	In bags, barrels, and other packages		In bulk		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	10, 259	$148, 128	30, 031	$133, 340	40, 290	$281, 468
1919	9, 676	137, 627	49, 838	105, 077	59, 514	242, 704
1920	29, 567	240, 923	108, 087	435, 576	137, 654	676, 499
1921	38, 374	333, 282	54, 721	197, 749	93, 095	531, 031
1922	[1] 24, 392	[1] 216, 718	89, 530	305, 620	113, 922	522, 338
1923	[1] 36, 185	[1] 240, 970	52, 565	142, 288	88, 750	383, 258
1924	[1] 40, 426	[1] 209, 641	48, 512	114, 451	88, 938	324, 092
1925	[1] 26, 973	[1] 188, 912	58, 815	127, 915	85, 788	316, 827
1926	[1] 29, 008	[1] 138, 356	26, 956	63, 887	55, 964	202, 243
1927	[1] 28, 773	[1] 125, 236	16, 195	42, 439	44, 968	167, 675

[1] Includes salt imported for curing fish, as follows: 1922, 2,252 short tons, valued at $5,549; 1923, 16,472 tons, $46,260; 1924, 27,096 tons, $61,581; 1925, 17,976 tons, $51,332; 1926, 24,310 tons, $50,915; 1927, 25,048 tons, $55,054.

Salt imported into the United States, 1924–1927, by countries

[General imports]

Country	1924		1925		1926		1927	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
North America:								
Canada	3, 476, 843	$20, 554	3, 744, 003	$20, 680	2, 931, 833	$4, 884	430, 246	$1, 625
Mexico	----------	-------	3, 875	31	1, 486, 152	2, 637	20, 000	98
West Indies—								
British—								
Jamaica	15, 422, 360	16, 548	12, 604, 350	19, 080	10, 997, 900	16, 403	10, 616, 050	14, 634
Other British	50, 040, 105	57, 446	43, 797, 963	47, 363	30, 946, 870	37, 145	4, 952, 170	6, 041
Dominican Republic	----------	-------	209, 437	380	----------	-------	67, 500	163
French	180, 000	270	198, 414	360	112, 240	173	389, 000	944
Netherland	4, 094, 929	5, 181	10, 546, 196	11, 911	5, 040, 610	6, 085	6, 031, 594	9, 541
Virgin Islands of the United States	----------	-------	4, 000	18	----------	-------	----------	-------
South America: Peru	----------	-------	----------	-------	----------	-------	1, 036	38
Europe:								
Belgium	----------	-------	17	2	----------	-------	----------	-------
France	----------	-------	232, 960	2, 633	2, 505	32	----------	-------
Germany	40, 951, 106	72, 226	25, 013, 932	44, 167	7, 031, 969	12, 697	1, 692, 501	8, 465
Italy	----------	-------	----------	-------	----------	-------	14, 874, 000	12, 068
Malta, Gozo, and Cyprus Islands	22, 400	86	----------	-------	----------	-------	----------	-------
Netherlands	896, 000	1, 200	----------	-------	----------	-------	----------	-------
Spain	35, 996, 400	29, 947	30, 128, 000	31, 066	44, 127, 543	39, 501	49, 024, 640	49, 666
Switzerland	----------	-------	----------	-------	----------	-------	22	5
Turkey in Europe	----------	-------	----------	-------	56, 000	484	----------	-------
United Kingdom	15, 764, 896	121, 173	15, 434, 656	123, 994	9, 379, 063	87, 210	7, 208, 548	64, 241
Asia:								
Hong Kong	280	24	----------	-------	----------	-------	----------	-------
Japan	----------	-------	----------	-------	1, 120	24	1, 070	21
Africa:								
Algeria and Tunisia	31, 997, 564	18, 626	15, 423, 275	10, 459	9, 240, 320	7, 644	----------	-------
Portuguese	380, 800	110	----------	-------	100, 800	90	536, 000	970
Oceania:								
Australia	----------	-------	2, 240	63	----------	-------	----------	-------
French	----------	-------	2, 678, 089	7, 576	----------	-------	----------	-------
	199, 223, 683	343, 391	160, 021, 407	319, 783	121, 454, 925	215, 009	95, 844, 377	168, 520

Salt exported from the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	136, 783	$1, 677, 577	1923	125, 529	$1, 211, 226
1919	119, 416	1, 396, 625	1924	144, 945	1, 288, 376
1920	139, 272	1, 901, 593	1925	155, 079	1, 219, 935
1921	109, 563	1, 415, 471	1926	158, 908	1, 277, 790
1922	134, 989	1, 429, 172	1927	153, 832	1, 329, 980

Salt exported from the United States, 1924–1927, by countries

Country	1924		1925		1926		1927	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
North America:								
Bermuda	223, 036	$2, 905	237, 183	$3, 034	148, 867	$2, 174	158, 027	$2, 411
British Honduras	330, 945	2, 843	280, 815	2, 317	416, 170	3, 332	676, 601	4, 363
Canada	217, 560, 848	754, 836	231, 093, 426	672, 285	225, 134, 503	697, 230	219, 434, 815	744, 932
Central American States—								
Costa Rica	187, 533	2, 378	92, 310	1, 124	134, 500	1, 585	147, 060	2, 045
Guatemala	189, 319	3, 082	230, 384	2, 779	292, 907	4, 139	602, 815	4, 618
Honduras	2, 122, 121	20, 318	2, 520, 355	22, 929	2, 231, 638	20, 412	4, 674, 156	33, 025
Nicaragua	762, 409	8, 856	678, 543	9, 185	688, 778	8, 284	1, 112, 967	11, 190
Panama	1, 730, 796	15, 499	1, 686, 112	15, 569	1, 903, 410	17, 188	1, 470, 556	13, 571
Salvador	948	22	102, 846	705	376	19	3, 048	47
Mexico	10, 292, 980	97, 881	11, 480, 952	111, 072	16, 043, 576	126, 619	17, 196, 038	144, 557
Miquelon, Langley, etc	1, 080	34	5, 340	140	3, 080	93	2, 616	67
Newfoundland and Labrador	91, 635	1, 107	171, 854	1, 885	128, 800	575	----------	-------

Salt exported from the United States, 1924–1927, by countries—Continued

Country	1924		1925		1926		1927	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
North America—Con.								
West Indies—								
British—								
Barbados	-----	-----	680	$11	-----	-----	-----	-----
Jamaica	272,136	$1,631	268,808	1,215	47,462	$315	67,997	$537
Trinidad and Tobago	350	10	-----	-----	-----	-----	-----	-----
Other British	15,472	297	4,716	141	24,639	486	70,414	737
Cuba	51,662,620	292,033	56,794,230	287,722	64,815,515	315,423	56,029,595	280,566
Dominican Republic	202,357	4,601	167,505	4,793	34,756	1,075	187,278	1,731
French	-----	-----	300	10	-----	-----	-----	-----
Haiti	7,749	294	18,358	537	10,816	419	10,307	376
Netherland	620	35	7,029	89	201	5	5,445	103
Virgin Islands of the United States	2,852	86	2,895	90	4,444	136	27,393	233
South America:								
Argentina	12,500	163	47,350	1,224	87,534	1,537	2,072	99
Bolivia	1,000	165	-----	-----	-----	-----	50	4
Chile	1,030	37	1,780	66	3,360	129	2,448	105
Colombia	103,332	2,037	68,737	1,002	55,307	1,222	139,746	1,740
Ecuador	450	45	1,544	130	25,896	442	3,654	566
Guiana—								
British	96	2	-----	-----	-----	-----	-----	-----
Surinam (Netherland)	-----	-----	-----	-----	-----	-----	330	14
Paraguay	1,200	44	-----	-----	2,425	90	2,450	89
Peru	60	6	500	14	-----	-----	-----	-----
Uruguay	-----	-----	500	47	-----	-----	-----	-----
Venezuela	-----	-----	170	26	145	11	900	16
Europe:								
France	8,018	71	23,287	183	27,000	245	8,000	72
Germany	8,625	73	18,818	145	-----	-----	110,380	1,015
Iceland and Faroe Islands	1,000	36	1,300	45	-----	-----	-----	-----
Netherlands	1,526	19	-----	-----	-----	-----	7,531	27
Norway	-----	-----	-----	-----	-----	-----	400	21
Soviet Russia	-----	-----	-----	-----	432	12	-----	-----
Sweden	-----	-----	11,000	120	-----	-----	-----	-----
Turkey in Europe	-----	-----	-----	-----	-----	-----	330	11
United Kingdom	142,274	755	158,080	887	82,512	793	208,104	1,228
Yugoslavia and Albania	1,400	50	-----	-----	-----	-----	-----	-----
Asia:								
Ceylon	2,750	273	3,086	292	2,940	272	5,848	359
China	54,115	3,314	56,124	4,680	56,178	3,774	50,675	2,764
Chosen	1,398	33	3,882	89	(1)	(1)	(1)	(1)
East Indies—								
British—								
India	4,522	412	7,542	736	7,594	687	16,266	710
Malaya	696	70	600	57	2,158	159	6,106	375
Netherland—								
Java and Madura	2,220	183	1,362	118	3,278	262	5,150	206
Other	-----	-----	-----	-----	100	10	120	14
Hong Kong	42,700	2,652	52,537	2,429	40,041	2,269	33,742	1,814
Indo-China, French	-----	-----	-----	-----	-----	-----	1,456	70
Japan	159,740	1,013	162,966	735	[1] 76,555	[1] 467	[1] 431,042	[1] 1,920
Kwantung	3,000	260	2,940	259	3,520	234	3,355	248
Persia	-----	-----	-----	-----	-----	-----	172	11
Philippine Islands	403,938	11,105	462,587	9,931	338,026	10,125	236,730	7,289
Siam	1,550	155	5,040	500	5,190	461	4,270	370
Soviet Russia	-----	-----	206,092	1,059	110,390	632	101,500	471
Syria	-----	-----	-----	-----	-----	-----	4,520	132
Other	-----	-----	-----	-----	624	30	-----	-----
Africa:								
British—								
South (Union of)	-----	-----	-----	-----	-----	-----	324	14
West	-----	-----	-----	-----	-----	-----	2,259	40
Canary Islands	4,000	120	-----	-----	-----	-----	-----	-----
Liberia	-----	-----	978	20	-----	-----	123	38
Portuguese ("Other")	274	8	115	7	240	25	120	12
Oceania:								
British—								
Australia	2,812,921	49,063	2,422,637	46,749	4,365,861	47,479	3,661,155	53,315
New Zealand	98,300	2,815	302,793	7,429	192,030	3,621	440,533	6,356
Other British	14,750	298	14,900	330	56,850	1,123	27,279	528
French	296,762	3,887	252,935	2,429	205,502	2,170	267,368	2,808
Other	45,150	464	21,936	565	-----	-----	-----	-----
	289,889,103	1,288,376	310,158,759	1,219,935	317,816,126	1,277,790	307,663,636	1,329,980

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[1] Chosen included with Japan.

WORLD PRODUCTION

Salt produced in the chief countries of the world, 1922–1926, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1922	1923	1924	1925	1926
North America:					
Canada	[1] 164, 920	187, 773	191, 176	216, 729	235, 938
Guatemala	(2)	(2)	(2)	57	4, 805
Mexico [3]	67, 000	67, 000	67, 000	67, 000	67, 000
Panama	[4] 826	(2)	(2)	(2)	1, 280
United States—					
Rock salt	1, 766, 392	1, 908, 346	1, 873, 061	2, 125, 196	1, 937, 482
Other salt	4, 395, 945	4, 560, 494	4, 298, 589	4, 585, 668	4, 749, 886
West Indies—					
British—					
Bahamas [4]	3, 079	2, 723	1, 595	1, 312	7, 476
Grenada (Windward Islands) [4]	20	67	54	71	56
Leeward Islands [4]	(2)	(2)	1, 207	802	(2)
Turks and Caicos Islands [4]	66, 704	58, 992	53, 167	63, 434	54, 824
Netherland [4]	18, 459	11, 795	8, 894	18, 377	10, 159
South America:					
Argentina [5]	93, 698	110, 701	122, 432	75, 351	96, 655
Chile	33, 743	38, 242	36, 093	29, 334	34, 903
Colombia [3]	29, 000	29, 000	29, 000	29, 000	29, 000
Peru	26, 126	26, 522	28, 974	28, 371	30, 114
Venezuela [3]	30, 000	30, 000	30, 000	30, 000	30, 000
Europe:					
Austria—					
Rock salt	2, 328	1, 520	2, 744	2, 087	3, 227
Other salt	142, 072	81, 771	108, 425	128, 720	141, 914
Bulgaria	20, 000	(2)	37, 000	25, 000	(2)
Czechoslovakia	128, 179	134, 080	124, 773	76, 683	98, 105
France—					
Rock salt and salt from springs	1, 083, 197	1, 188, 586	1, 317, 908	1, 462, 420	1, 442, 000
Other salt	306, 531	337, 703	256, 943	262, 008	(2)
Germany—					
Rock salt	2, 684, 318	1, 583, 978	1, 596, 416	1, 767, 282	1, 965, 847
Other salt	391, 178	291, 518	377, 277	456, 810	479, 547
Greece	67, 500	59, 908	68, 542	79, 316	89, 726
Italy—					
Rock salt	49, 802	52, 754	56, 896	63, 984	67, 610
Other salt	740, 507	711, 892	750, 424	851, 653	698, 642
Netherlands—Rock salt	28, 334	26, 813	32, 054	34, 053	34, 505
Poland	[6] 295, 403	467, 592	371, 182	429, 988	457, 503
Portugal [4]	(2)	106, 280	90, 804	(2)	(2)
Rumania	285, 212	306, 612	302, 761	330, 356	344, 062
Russia [7]	773, 669	987, 083	1, 074, 477	1, 214, 211	1, 457, 202
Spain—					
Rock salt	114, 400	98, 619	105, 450	106, 627	118, 581
Other salt	566, 480	617, 207	862, 856	753, 514	978, 688
Switzerland	64, 268	68, 026	74, 020	75, 120	77, 267
United Kingdom—					
Great Britain and Isle of Man—					
Rock salt	26, 998	38, 494	43, 076	35, 281	35, 152
Other salt	1, 756, 017	1, 860, 170	2, 016, 914	1, 912, 061	1, 708, 864
Ireland, Northern—					
Rock salt	10, 136	11, 205	11, 235	10, 052	6, 191
Other salt	7, 938	7, 297	7, 370	7, 230	4, 961
Yugoslavia	43, 872	[3] 46, 000	48, 864	48, 499	52, 260
Asia:					
Ceylon	39, 623	28, 834	9, 412	20, 588	16, 218
China (including Kwantung)	[3] 3, 600, 000	[3] 3, 600, 000	[3] 3, 600, 000	[8] 3, 639, 000	[3] 3, 600, 000
Chosen	45, 000	40, 200	(2)	(2)	(2)
Cyprus [3]	3, 000	3, 000	3, 000	3, 000	3, 000
India—					
British (including Aden)—					
Rock salt	216, 639	121, 594	192, 274	152, 794	149, 025
Other salt	1, 469, 804	1, 688, 150	1, 457, 258	1, 163, 137	1, 516, 026
Portuguese [3]	12, 000	12, 000	12, 000	12, 000	12, 000
Indo-China [4]	56, 138	11, 398	4, 251	5, 955	20, 456
Japan—					
Japan proper [9]	665, 096	479, 908	637, 169	668, 682	722, 134
Taiwan	138, 000	239, 200	136, 200	138, 000	135, 232
Netherland East Indies	170, 246	150, 636	131, 860	327, 679	371, 744
Philippine Islands	69, 345	76, 194	28, 919	30, 683	24, 075
Russia [7]	43, 479	89, 967	93, 078	213, 195	184, 552
Siam [10]	26, 542	32, 948	40, 564	35, 195	(2)
Turkey [3]	100, 000	100, 000	100, 000	100, 000	100, 000

Salt produced in the chief countries of the world, 1922–1926, in metric tons—Con.

Country	1922	1923	1924	1925	1926
Africa:					
Algeria	20,208	25,079	23,541	27,005	43,216
Belgian Congo [3]	80	80	80	80	80
Egypt [4]	186,793	157,242	209,900	210,978	180,190
Eritrea [3]	20,000	20,000	20,000	20,000	20,000
Mauritius [3]	1,500	1,500	1,500	1,500	1,500
Morocco, French	(2)	(2)	3,000	(2)	(2)
Nigeria [3]	400	400	400	400	400
Portuguese West Africa (Angola) [3]	2,000	2,000	2,000	2,000	2,000
Somaliland—					
British [3]	15,000	15,000	15,000	15,000	15,000
French [3]	15,000	15,000	15,000	15,000	15,000
Southwest African Protectorate	(2)	(2)	340	432	400
Sudan, Anglo-Egyptian [3]	9,000	9,000	9,000	9,000	9,000
Tanganyika Territory	2,427	1,918	4,629	4,000	3,155
Tunisia	51,950	72,982	123,606	128,442	132,080
Union of South Africa	75,806	62,170	70,369	59,269	(2)
Oceania:					
Australia—					
South Australia	49,438	51,093	63,693	79,507	92,563
Victoria [3]	40,000	40,000	40,000	40,000	40,000
Western Australia [3]	8,000	8,000	8,000	8,000	8,000

[1] Sales and shipments.

[2] Data not available.

[3] Estimated annual production.

[4] Exports.

[5] Railway shipments.

[6] Exclusive of salt content of brine used in manufacture of soda, data for which are not available for 1922.

[7] Year ended Sept. 30.

[8] Figures of production as published by the Geological Survey of China, Special Report No. 2, Peking, 1926.

[9] Fiscal year ended Mar. 31 of the year following that stated. The figures do not include output from salt beds which, though situated on Government beach lands, have no fixed areas.

[10] Exports for fiscal year ended Mar. 31 of the year following that stated.

LOCALITIES PRODUCING SALT IN THE UNITED STATES IN 1927

The salt deposits in the United States that furnish salt for commercial purposes are, with the exception of small deposits used for local supply, confined to definite regions in the northeastern, south central, and western parts of the country. Michigan, New York, and Ohio, included in the first group, furnished 72 per cent of the total salt sold or used by producers in 1927. Kansas and Louisiana, in the central belt of States, are the next largest producers, and California is chief among the Western States.

The salt is marketed as evaporated salt, rock salt, and salt in brine for the manufacture of chemicals. To furnish information often requested regarding the operation of salt properties, the producing companies in 1927, the situation of their plants, and the nature of the salt sold or used by them, as reported to the Bureau of Mines, are given by States on the following pages.

ARIZONA

Yavapai County: Camp Verde—Sodium Products Corporation (address, 524 Pacific Mutual Building, Los Angeles, Calif.); rock salt. This salt is mined incidental to the production of natural sodium sulphate and is sold in crude form as cattle salt to local ranchers.

CALIFORNIA

In California salt is obtained from sea water, from salt springs, lakes, etc., and rock salt. The greater part of the production is from the solar evaporation of sea water, especially along the shores of San

Francisco Bay in Alameda and San Mateo Counties. Reports were received in 1927 from the following:

Alameda County:
  Alvarado—Leslie-California Salt Co. (address, 155 Montgomery Street, San Francisco); evaporated salt (solar, vacuum pans), pressed blocks from evaporated salt.
  ——— Pioneer Salt Co. (address, 200 Sacramento Street, San Francisco); solar evaporation. Plant sold September, 1927, to the Oliver Salt Co.
  Mount Eden—American Salt Co. (address, 781 Green Street, San Francisco); solar evaporation.
  ——— Dumbarton Land & Improvement Co. (address, 504 Standard Oil Building, San Francisco); solar evaporation.
  ——— Oliver Salt Co.; evaporated salt (open pans or grainers, solar). Plant taken over in November, 1927, by the Leslie-California Salt Co.
  Mount Eden and Newark—Arden Salt Works (successor to Union Pacific Salt Co. at Mount Eden) (address, Standard Oil Building, San Francisco); solar evaporation.
Inyo County: Keeler (Saline Valley)—Sierra Salt Co. (address, 1151 South Broadway, Los Angeles); produced salt by solar evaporation in 1927, but product has not yet been placed on the market.
Kern County:
  Saltdale (Ceneda)—Consolidated Salt Co. of California (address, Long Beach). On a playa known as Cane Lake; solar evaporation.
  Saltdale (Toby)—Long Beach Salt Co. (successor to the Freemont Salt Co.) (address, Long Beach). On Cane Lake; solar evaporation.
Los Angeles County: Long Beach (Anaheim Road)—Long Beach Salt Co.; solar evaporation.
Modoc County: Cedarville (8 miles southeast)—Surprise Valley Salt Works; solar evaporation.
Monterey County: Moss Landing—Monterey Bay Salt Co.; solar evaporation.
San Bernardino County: Amboy (Saltus)—California Rock Salt Co. (address, 2461 Hunter Street, Los Angeles); rock salt, also calcium chloride from Amboy playa.
San Diego County: San Diego (south end of San Diego Bay)—Western Salt Co.; solar evaporation.
San Mateo County: Leslie—Leslie-California Salt Co. (address, 155 Montgomery Street, San Francisco); evaporated salt (solar, vacuum pans), pressed blocks from evaporated salt.

IDAHO

Salt has been produced in small quantities from salt springs and rock-salt deposits in southeastern Idaho. The producing plants are small, and operations are irregular. No production was reported in 1927.

KANSAS

In 1927 Kansas ranked fourth among the salt-producing States. The salt sold in the State is rock salt and evaporated salt made from brines obtained from solution of rock salt. The companies reporting in 1927 were as follows:

Ellsworth County:
  Kanopolis—Crystal Salt Co. (address, Equitable Building, Denver, Colo.); rock salt.
  ——— Independent Salt Co. (address, 33 South Clark Street, Chicago, Ill.); rock salt.
Harper County: Anthony—Kansas-Oklahoma Utilities Co. (successor to the Anthony Ice & Salt Co.); evaporated salt (open pans or grainers), pressed blocks from evaporated salt.

Reno County:
Hutchinson—The Barton Salt Co.; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
——— Carey Salt Co. (east plant); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
——— ——— (rock salt mine); rock salt, pressed blocks from rock salt.
——— Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Rice County:
Lyons—American Salt & Coal Co. (address, La Salle Building, Kansas City, Mo.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt, rock salt, pressed blocks from rock salt.
——— Western Salt Co. (address, Manufacturers Exchange, Kansas City, Mo.); evaporated salt (vacuum pans), pressed blocks from evaporated salt, rock salt, pressed blocks from rock salt.
Sterling—Sterling Salt Co.; evaporated salt (open pans or grainers).

LOUISIANA

Louisiana in 1927 ranked fifth in the quantity of salt produced. Rock salt and evaporated salt are produced. The firms reporting in 1927 were:

Iberia Parish:
Avery Island—Avery Rock Salt Mining Co. (address, Scranton, Pa.); rock salt.
Jefferson Island—Jefferson Island Salt Mining Co. (Inc.) (address, Louisville, Ky.); rock salt, pressed blocks from rock salt.
Weeks Island—Myles Salt Co. (Ltd.) (address, New Orleans); rock salt, pressed blocks from rock salt.
St. Martin Parish:
Anse La Butte—Mulkey Salt Co. (successor to Lafayette Salt Co. (Inc.)) (address, Detroit, Mich.); evaporated salt (vacuum pans).
Lafayette—Star Salt Corporation; evaporated salt (vacuum pans).

MICHIGAN

Michigan ranked first among the salt-producing States in 1927. The output is obtained from both rock salt and natural brine. The large quantity of brine used in the manufacture of chemicals keeps the State in first place, but in actual production of salt as such Michigan ranks second and New York first. In 1927 reports of production were received from the following companies:

Bay County: Bay City—Halverson Lumber & Salt Co.; evaporated salt (grainers).
Manistee County: Manistee—Ruggles & Rademaker; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Mason County: Ludington—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Midland County: Midland—The Dow Chemical Co.; evaporated salt (vacuum pans), also bromine, magnesium chloride, and calcium chloride.
Saginaw County:
Carrollton—Mershon, Eddy, Parker Co. (address, Saginaw); evaporated salt (open pans or grainers).
——— Saginaw Salt Products Co. (address, Saginaw); evaporated salt (open pans or grainers), pressed blocks from evaporated salt, also calcium chloride.
Saginaw—Estate of Edward Germain; evaporated salt (open pans or grainers).
——— Strable Lumber & Salt Co.; evaporated salt (open pans or grainers).

St. Clair County:
  Marine City—Michigan Salt Works; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
  Port Huron—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
  St. Clair—Diamond Crystal Salt Co.; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Wayne County:
  Delray—The Solvay Process Co. (address, Syracuse, N. Y.); brine for the manufacture of chemicals.
  Detroit—Detroit Rock Salt Co. (address, Scranton, Pa.); rock salt.
  ——— Mulkey Salt Co.; evaporated salt (open pans or grainers, vacuum pans).
  Ecorse—Worcester Salt Co. (address, 71 Murray Street, New York, N. Y.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
  Wyandotte—Michigan Alkali Co.; brine for the manufacture of chemicals.
  ——— Pennsylvania Salt Manufacturing Co. (address, Widener Building, Philadelphia, Pa.); evaporated salt (open pans or grainers), brine for the manufacture of chemicals.

NEVADA

In 1927 a small quantity of solar salt was produced at St. Thomas, Clark County, by Levi Syphus, and near Fallon, Churchill County, by the C. W. Kinney Salt Co.

NEW MEXICO

Production of salt in New Mexico in 1927 was reported at Salt Lake, Catron County, by Frank A. Hubbell Co., of Albuquerque, and near Willard, Torrance County, by the New Mexico Salt Co.

NEW YORK

If the salt content of brine used in the manufacture of chemicals is included, New York ranked second among the salt-producing States in 1927, but it ranked first in sales of crystallized salt. The salt industry is older than that of any other salt-producing State. Both evaporated and rock salt are supplied by producers, but, except for a small amount obtained by solar evaporation of spring water, the entire product is from rock salt. Brine for evaporated salt is obtained by dissolving the rock salt with water that is allowed to flow into the beds and is pumped out when saturated. The producing companies in 1927 were as follows:

Genesee County: Le Roy—Le Roy Salt Co.; evaporated salt (open pans or grainers).
Livingston County:
  Cuylerville (Halite)—Sterling Salt Co. (address, 29 Broadway, New York); rock salt.
  Piffard—Kerr-Remington Salt Co. (Inc.) (successor to Alex. Kerr Bro. & Co. (Inc.) (address, 800 North Delaware Avenue, Philadelphia, Pa.); evaporated salt (open pans or grainers, vacuum pans).
  Retsof—Retsof Mining Co. (address, Scranton, Pa.); rock salt.
Onondaga County:
  Salina [2]—Thomas Gale (address, Syracuse); solar salt. Sales from stock; plant wrecked.
  Solvay and Tully—The Solvay Process Co. (address, Syracuse); evaporated salt (open pans or grainers), brine for the manufacture of chemicals and refined salt as a by-product.

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[2] This plant represents the last of the operations on the Onondaga Salt Springs Reservation. Production records for this reservation are available since 1797. Until 1908 the springs were controlled by the State, which received a royalty on the output.

Schuyler County:
  Watkins Glen—International Salt Co. (address, Scranton, Pa.); evaporated salt (open pans or grainers, vacuum pans).
  ——— The Watkins Salt Co.; evaporated salt (open pans or grainers).
Tompkins County:
  Ithaca (east shore Cayuga Lake)—Kerr-Remington Salt Co. (Inc.) (successor to Remington Salt Co.) (address, 800 North Delaware Avenue, Philadelphia, Pa.); evaporated salt (open pans or grainers, vacuum pans).
  Ludlowville—International Salt Co. (address, Scranton, Pa.); evaporated salt (open pans or grainers, vacuum pans).
  Myers—Cayuga Rock Salt Co. (Inc.); rock salt.
Wyoming County: Silver Springs—Worcester Salt Co. (address, 71 Murray Street, New York); evaporated salt (open pans or grainers, vacuum pans).

OHIO

Ohio ranked third in the production of salt in 1927. The larger part of the output is used in the form of brine for the manufacture of chemicals.

Cuyahoga County: Cleveland—The Union Salt Co.; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Lake County: Painesville—Diamond Alkali Co. (address, 511 Wood Street, Pittsburgh, Pa.); brine for the manufacture of chemicals.
Medina County: Wadsworth—The Wadsworth Salt Co.; evaporated salt. Plant dismantled; company in process of liquidation.
Meigs County:
  Minersville—Pomeroy Salt Corporation (address, Pomeroy); evaporated salt (open pans or grainers), also bromine and calcium chloride.
  Pomeroy—The Excelsior Salt Works; evaporated salt (open pans or grainers), also bromine and calcium chloride.
Summit County:
  Barberton—Pittsburgh Plate Glass Co.; brine for the manufacture of chemicals.
  Kenmore—The Colonial Salt Co. (address, Akron); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Wayne County: Rittman—The Ohio Salt Co. (address, Wadsworth); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.

OKLAHOMA

The principal production of salt in Oklahoma is at Sand Springs, Tulsa County, where the Martin Process Co. (successor to the Sand Springs Chemical Co.) manufactures salt from brine obtained as a by-product from oil wells by a process in which the brine is cooled by passing through a spray. Calcium chloride is also produced at this plant. An unrecorded quantity of evaporated salt is also taken from playas and lagoons and used locally as cattle salt.

PORTO RICO

Salt was reported as produced in Porto Rico in 1927 by the following:

F. Carrera & Hno., Mayaguez; works at Cabo Rojo, Guanica, and Salinas.
Miguel Antonio Ramirez, San German; works at Lajas.

TEXAS

Salt was produced in Texas in 1927 as follows:

Anderson County: Palestine—Palestine Salt & Coal Co.; evaporated salt (open pans or grainers), pressed blocks from evaporated salt.
Fort Bend County: Hobby—Texas Salt Co. (address, Esperson Building, Houston); evaporated salt (open pans or grainers).

Van Zandt County: Grand Saline—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.

Salt formed by the evaporation of the waters of playas and lagoons is also used locally by cattlemen but there is no record of the quantity so used.

UTAH

Production of salt in Utah in 1927 was reported by the following companies:

Juab County: Nephi—Jesse Coulson; evaporated salt.
Salt Lake County: Saltair—Royal Crystal Salt Co. (successor to Inland Crystal Salt Co.) (address, 133 Regent Street, Salt Lake City); solar evaporation, pressed blocks from evaporated salt.
Sanpete County: Axtell—Royal Crystal Salt Co. (successor to Inland Crystal Salt Co.) (address, 133 Regent Street, Salt Lake City); rock salt.
Sevier County: Redmond—Great Western Salt Co. (successor to Gunnison Valley Salt Co.); rock salt.
Tooele County: Burmester—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); solar evaporation, pressed blocks from evaporated salt.

VIRGINIA

Salt brine is produced in Virginia at Saltville, Smyth County, by the Mathieson Alkali Works (Inc.) for the manufacture of chemicals.

WEST VIRGINIA

The salt made in West Virginia is all obtained from natural brines. In 1927 the operators were as follows:

Kanawha County:
  Malden—J. Q. Dickinson & Co.; evaporated salt (open pans or grainers), also bromine and calcium chloride.
  South Charleston—Westvaco Chlorine Products (Inc.); brine used in the manufacture of chlorine, also produces bromine.
Mason County:
  Hartford—Liverpool Salt & Coal Co.; evaporated salt (open pans or grainers), also bromine and calcium chloride.
  Mason—Ohio River Salt Co.; evaporated salt (open pans or grainers), also bromine and calcium chloride.

BROMINE

In 1927 the bromine recovered by the producers from natural brine and the bromine content of bitterns used by producers in the manufacture of bromine compounds was 41 per cent more than in 1926. The larger part of the bromine output as reported is not sold as bromine but as potassium and sodium bromide and other salts. The figures given in the table include the bromine content of these salts. The plants operated in 1927 were those of the Dow Chemical Co., Midland, Mich.; Pomeroy Salt Corporation (address, Pomeroy, Ohio), Minersville, Ohio; Excelsior Salt Works, Pomeroy, Ohio; J. Q. Dickinson & Co., Malden, W. Va.; Liverpool Salt & Coal Co., Hartford, W. Va.; Ohio River Salt Co., Mason, W. Va.; and Westvaco Chlorine Products (Inc.), South Charleston, W. Va. So far as the Bureau of Mines is informed no bromine was produced directly from sea water in 1927, although experimental work in this direction continued. Extraction of bromine from bitterns produced at salt works on the California coast was reported.

Bromine and bromine in compounds sold or used by producers in the United States, 1918–1927

Year	Pounds	Value	Year	Pounds	Value
1918	1, 727, 156	$970, 099	1923	842, 352	$146, 176
1919	1, 854, 971	1, 234, 969	1924	2, 033, 804	594, 685
1920	1, 160, 584	745, 381	1925	1, 566, 120	488, 406
1921	711, 953	172, 759	1926	1, 245, 760	426, 837
1922	1, 005, 174	150, 668	1927	1, 756, 310	564, 689

The values of bromine reported to the Bureau of Mines by the producers, representing receipts for the year f. o. b. at the plants, averaged 32 cents a pound in 1927, compared with 34 cents in 1926.

According to Chemical and Metallurgical Engineering, the wholesale price per pound of bulk bromine as quoted in the New York market in 1927 was, as in 1926, 45 to 47 cents a pound throughout the year.

Imports of bromine compounds were not separately recorded by the Bureau of Foreign and Domestic Commerce prior to the change in tariff, September 22, 1922. The following table shows the imports of bromine and bromine compounds into the United States from 1923 to 1927.

Bromine and bromine compounds imported for consumption in the United States, 1923–1927

Product	1923		1924		1925		1926		1927	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Bromine	782	$1, 171	37, 318	$8, 958	8, 009	$2, 110	37, 839	$14, 486	--------	--------
Potassium bromide	52, 833	5, 736	935, 749	124, 414	237, 231	62, 028	70, 440	18, 549	20, 813	$7, 075
Sodium bromide	114, 341	10, 574	713, 659	110, 215	208, 434	52, 230	212, 365	73, 313	1, 102	370
Other bromine compounds	4, 123	1, 581	52, 408	13, 071	117, 867	46, 784	271, 645	102, 894	465, 048	144, 167

CALCIUM CHLORIDE

The calcium chloride reported in the following table is an original constituent of the natural brine produced in connection with the manufacture of salt or salt and bromine from mineral raw materials only. The calcium chloride reported includes an output of mixed calcium and magnesium chlorides and other salts. There was an increase of 16 per cent in the quantity of this product sold by the producers in 1927 as compared with 1926, and 1927 was the sixth year of increase. A further large output of calcium chloride made by manufacturing processes used in chemical industries is not reported. The production in 1927 was by the California Rock Salt Co. (address, Los Angeles), Saltus, Calif.; the Saline Products (Inc.) (address, 2000 Santa Fe Avenue, Los Angeles), Amboy, Calif.; the Dow Chemical Co., Midland, Mich.; Saginaw Salt Products Co., Saginaw, Mich.; Pomeroy Salt Corporation (address, Pomeroy, Ohio), Minersville, Ohio; Excelsior Salt Works, Pomeroy, Ohio; Martin Process Co. (successor to Sand Springs Chemical Co.), Sand Springs, Okla.; J. Q. Dickinson & Co., Malden, W. Va.; Liverpool Salt & Coal Co., Hartford, W. Va.; and Ohio River Salt Co., Mason, W. Va.

Calcium (calcium-magnesium) chloride from natural brines sold by producers in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	26, 624	$503, 452	1923	44, 961	$663, 384
1919	26, 123	321, 596	1924	58, 791	1, 164, 848
1920	27, 849	539, 471	1925	67, 870	1, 386, 639
1921	23, 672	510, 723	1926	82, 340	1, 710, 405
1922	33, 067	571, 326	1927	95, 721	1, 947, 797

Imports of calcium chloride were not separately recorded by the Bureau of Foreign and Domestic Commerce prior to the change in tariff September 22, 1922. The figures for imports since that time are shown in the following table:

Calcium chloride imported for consumption in the United States, September 22, 1922, to December 31, 1927

Year	Short tons	Value
1922 (Sept 22 to Dec. 31)	740	$8, 563
1923	3, 232	48, 527
1924	3, 996	54, 542
1925	2, 253	37, 121
1926	7, 372	96, 742
1927	6, 514	85, 456

GYPSUM

By R. M. Santmyers and Jefferson Middleton

INTRODUCTION

Diversification of products continues to be the outstanding feature of the gypsum industry. This movement has been so vigorous that the production of crude gypsum in this country has more than doubled within the last 10 years. During the past decade the industry has taken rank as one of the foremost of the rock-products operations, and the year 1927 has brought evidence of stabilization of the enterprises engaged therein and of the demand for gypsum and gypsum products. In addition to the development of the natural gypsum industry considerable progress was made in the utilization of waste calcium sulphate produced by chemical industries.

The prices of gypsum and gypsum products declined during 1927 in comparison with those of 1926, particularly for such products as wall board, block, and plaster. In some markets prices were 25 per cent under those of 1926; a fair average estimate for the entire country probably is a 5 to 8 per cent reduction. The fall in prices has been attributed to many reasons, but chiefly to the increased competition in the market which did not increase in proportion to the increase in capacity to produce. Estimates show that there was a 25 per cent increase in capacity in 1927, whereas new building was a little less than in 1926. As a result the plants operated only up to about 65 per cent of their capacity. Other important factors were the increased economies effected in manufacturing, which were passed on to the consumer in the way of price reductions. In several instances much of the incidental costs of starting new plants, plant improvements, and other changes made during 1926 had been taken care of and the producers were able to offer products at a lower price. On the west coast sharp competition by dealers in gypsum products lowered the ultimate price but had little effect on prices received by the manufacturers.

PRODUCTION

The quantity of crude gypsum mined in the United States in 1927 was 5,346,888 short tons, a decrease of 288,553 tons, or 5 per cent, compared with 1926. There were, however, 60 plants in operation during the year, one more than during 1926. The value of the sales of uncalcined and calcined gypsum by producers was $42,174,454, as compared with $46,721,219 in 1926, a decrease of $4,546,765, or 10 per cent. The value in 1927 is the smallest since 1923, when the total sales were valued at $34,888,155. Of the total quantity mined, 965,371 tons was sold without calcining, a slight increase over 1926, and was valued at $2,388,663, or $2.47 per ton, a decrease of 14 cents per ton. The quantity of calcined gypsum sold by producers was 3,912,211 tons, a decrease of 103,763 tons, or 3 per cent, and was valued at $39,785,791, or $10.17 per ton. This is a decrease of 10 per cent in total value and of 84 cents per ton compared with 1926.

In 1927 New York was again the largest producer of crude gypsum with 11 active plants reporting 1,675,501 tons, as compared with 11 plants reporting 1,723,460 tons in 1926. New York's production was nearly one-third of the entire quantity mined in the United States in 1927 and was more than twice that of the second State, Iowa. New York was also the largest seller of gypsum in 1927, marketing 290,368 tons without calcining, or 30 per cent of the United States total, and 1,291,967 tons calcined, or 33 per cent of the total. These figures represent a decrease of 11 per cent in the sales of uncalcined but an increase of 4 per cent in the sales of calcined gypsum compared with 1926.

Other important States in the production of crude gypsum in 1927 were: Iowa, 792,159 tons; Michigan, 668,617 tons; Texas, 508,382 tons; Ohio, 474,320 tons; Nevada, 327,365 tons; and Oklahoma, 271,484 tons. The five leading States reported 77 per cent of the total production.

The quantity of crude sold as agricultural gypsum by producers in 1927 was 29,452 tons, valued at $129,825, as compared with 27,294 tons, valued at $151,916, in 1926, an increase of 2,158 tons, or 8 per cent, in quantity but a decrease of $22,091, or 15 per cent, in value compared with 1926.

The quantity of Keenes cement sold by producers in 1927 was 41,431 tons, valued at $674,698, a decrease of 1,005 tons, or 2 per cent, in quantity, but an increase of $70,917, or 12 per cent, in value from 1926.

Gypsum building specialties, as a whole, showed an increase of 5 per cent in quantity of sales, but a decrease of 11 per cent in value. Plaster-board sales amounted to 249,219 tons, valued at $4,669,562, an increase of 82,353 tons, or 49 per cent, in quantity, and $1,475,368, or 46 per cent, in value, over 1926. The sales of wall board were 415,082 tons, valued at $11,165,965, a decrease of 28,974 tons, or 7 per cent, in quantity, and $3,242,831, or 23 per cent, in value, from 1926. Sales of partition tile decreased from 231,571 tons, valued at $2,476,807, in 1926 to 231,044 tons, valued at $2,102,985, in 1927. Special tile and blocks fell from 28,730 tons, valued at $315,097, in 1926 to 21,701 tons, valued at $280,436, in 1927.

Gypsum mined and uncalcined and calcined gypsum sold by producers in the United States, 1918–1927

Year	Number of active plants	Total quantity mined (short tons)	Sold without calcining		Sold calcined		Total value of sales
			Short tons	Value	Short tons	Value	
1918	57	2,057,015	470,192	$1,236,552	1,328,269	$10,234,302	$11,470,854
1919	57	2,420,163	510,245	1,518,203	1,596,020	14,209,704	15,727,907
1920	61	3,129,142	669,260	2,565,195	1,904,484	21,967,870	24,533,065
1921	62	2,890,784	642,944	2,266,011	1,796,851	21,434,279	23,700,290
1922	64	3,779,949	770,725	2,443,346	2,491,265	26,917,805	29,361,151
1923	62	4,753,448	847,242	2,577,436	3,101,378	32,310,719	34,888,155
1924	72	5,042,629	982,108	2,674,320	3,568,569	40,050,187	42,724,507
1925	61	5,678,302	1,014,135	2,823,229	4,096,357	44,754,011	47,577,240
1926	59	5,635,441	961,363	2,509,885	4,015,974	44,211,334	46,721,219
1927	60	5,346,888	965,371	2,388,663	3,912,211	39,785,791	42,174,454

Gypsum mined and uncalcined and calcined gypsum sold by producers in the United States, 1926–27, by States

State	Number of active plants	Total quantity mined (short tons)	Sold without calcining		Sold calcined		Total value of sales
			Short tons	Value	Short tons	Value	
1926							
Iowa	7	802, 910	129, 803	$296, 854	553, 498	$6, 291, 349	$6, 588, 203
Kansas	3	195, 440	47, 641	108, 792	111, 174	1, 111, 928	1, 220, 720
Michigan	5	659, 685	157, 787	379, 848	455, 616	4, 641, 617	5, 021, 465
Nevada	5	350, 972	52, 642	102, 282	218, 670	1, 424, 953	1, 527, 235
New York	11	1, 723, 460	328, 086	905, 095	1, 246, 822	15, 889, 494	16, 794, 589
Ohio	3	521, 205	13, 082	38, 788	509, 522	5, 758, 433	5, 797, 221
Oklahoma	3	324, 021	(1)	(1)	(1)	(1)	2, 301, 049
Texas	5	533, 156	(1)	(1)	(1)	(1)	4, 126, 400
Utah	3	36, 333	(1)	(1)	(1)	(1)	195, 535
Other States [2]	14	488, 259	[3] 232, 322	[3] 678, 226	[3] 920, 672	[3] 9, 093, 560	3, 148, 802
	59	5, 635, 441	961, 363	2, 509, 885	4, 015, 974	44, 211, 334	46, 721, 219
1927							
Iowa	7	792, 159	139, 637	391, 701	584, 305	6, 321, 796	6, 713, 497
Kansas	3	175, 351	37, 027	67, 474	98, 737	908, 175	975, 649
Michigan	6	668, 617	178, 378	331, 837	429, 639	3, 884, 687	4, 216, 524
Nevada	5	327, 365	61, 303	184, 452	217, 931	1, 299, 719	1, 484, 171
New York	11	1, 675, 501	290, 368	792, 410	1, 291, 967	14, 096, 980	14, 889, 390
Ohio	3	474, 320	11, 210	30, 761	456, 817	5, 011, 118	5, 041, 879
Oklahoma	4	271, 484	(1)	(1)	(1)	(1)	2, 073, 944
Texas	4	508, 382	(1)	(1)	(1)	(1)	4, 003, 456
Other States [2]	17	453, 709	[3] 247, 448	[3] 590, 028	[3] 832, 815	[3] 8, 263, 316	2, 775, 944
	60	5, 346, 888	965, 371	2, 388, 663	3, 912, 211	39, 785, 791	42, 174, 454

[1] Included under "Other States."

[2] 1926: Arizona, California, Colorado, Montana, New Mexico, South Dakota, Virginia, and Wyoming; 1927: Arizona, California, Colorado, Montana, New Mexico, South Dakota, Utah, Virginia, and Wyoming.

[3] This figure includes also sales from States entered as "(1)" above.

Gypsum sold by producers in the United States, 1926–27, by uses

Use	1926		1927	
	Short tons	Value	Short tons	Value
Without calcining:				
To cement mills	928, 885	$2, 326, 635	928, 307	$2, 237, 548
For agriculture	27, 294	151, 916	29, 452	129, 825
For other uses	5, 184	31, 334	7, 612	21, 290
	961, 363	2, 509, 885	965, 371	2, 388, 663
Calcined:				
Stucco	543, 729	3, 365, 116	421, 987	2, 493, 910
Neat plaster	2, 150, 243	16, 066, 220	2, 069, 945	14, 324, 857
Sanded plaster	133, 255	869, 208	207, 210	1, 414, 749
Plaster of Paris, molding, casting plaster, etc	[1] 206, 226	[1] 2, 014, 926	[1] 173, 080	[1] 1, 542, 916
Keenes cement	42, 436	603, 781	41, 431	674, 698
To plate-glass works	14, 589	114, 767	18, 372	132, 203
Plaster board	[2] 166, 866	[2] 3, 194, 194	249, 219	4, 669, 562
Wall board	[2] 444, 056	[2] 14, 408, 796	415, 082	11, 165, 965
Partition tile	231, 571	2, 476, 807	231, 044	2, 102, 985
Special tile and blocks	28, 730	315, 097	21, 701	280, 436
Other purposes [3]	54, 273	782, 422	63, 140	983, 510
	4, 015, 974	44, 211, 334	3, 912, 211	39, 785, 791
Grand total value		46, 721, 219		42, 174, 454

[1] Includes dental plaster.

[2] Revised figures.

[3] Includes roof tile, insulating material, fireproofing, etc.

Keenes cement sold by producers in the United States, 1918–1927

Year	Manufacturers	Short tons	Value	Year	Manufacturers	Short tons	Value
1918	5	12,823	$151,802	1923	5	23,273	$323,127
1919	6	15,395	200,360	1924	6	30,620	428,684
1920	6	16,542	246,433	1925	5	36,607	503,397
1921	7	14,430	232,457	1926	4	42,436	603,781
1922	6	21,991	324,316	1927	4	41,431	674,698

KETTLES AND KILNS IN OPERATION

The following table gives a comparison of the number and distribution of kettles and kilns (rotary and vertical) in operation in 1926 and 1927. Michigan, New York, and Texas were the only States operating more kettles in 1927 than in 1926—New York with three more and Texas with one more; figures for Michigan in 1926 may not be published. Though some of the States did not operate more kettles and kilns in 1927 than in 1926 the total daily capacity showed a favorable increase. This is due in most cases to enlargement of the kettles and better operating economies.

Calcining kettles and kilns reported by gypsum producers in the United States, 1926–27, by States

State	Number of producers	Kettles		Rotary kilns [1]		Total daily capacity (short tons)
		Number	Daily capacity (short tons)	Number	Daily capacity (short tons)	
1926						
Iowa	6	28	3,904	------	------	3,904
Kansas	3	(2)	(2)	(2)	(2)	800
Michigan	5	(2)	(2)	(2)	(2)	2,500
Nevada	3	13	1,300	------	------	1,300
New York	8	20	2,875	10	3,570	6,445
Ohio	3	11	2,450	------	------	2,450
Texas	5	39	2,715	------	------	2,715
Other States [3]	19	[4] 82	[4] 6,694	[4] 6	[4] 860	4,254
	52	193	19,938	16	4,430	24,368
1927						
Iowa	6	28	4,224	------	------	4,224
Kansas	3	(2)	(2)	(2)	(2)	790
Michigan	6	27	2,795	------	------	2,795
Nevada	3	13	1,450	------	------	1,450
New York	8	23	3,590	10	3,520	7,110
Ohio	3	11	2,360	------	------	2,360
Texas	5	40	2,920	------	------	2,920
Other States [3]	18	[4] 53	[4] 4,807	[4] 5	[4] 500	4,517
	52	195	22,146	15	4,020	26,166

[1] Includes a few vertical kilns reported by one operator in California.

(2) Included under "Other States."

[3] 1926: Arizona, California, Colorado, Montana, New Mexico, Oklahoma, Oregon, South Dakota, Utah, Virginia, and Wyoming; 1927: Arizona, California, Colorado, Montana, New Mexico, Oklahoma, South Dakota, Utah, Virginia, and Wyoming.

[4] This figure covers also States entered as "(2)" above.

PRICES AND MARKETS

The price of crude gypsum in 1927 showed a slight decrease from the price in 1926. The ground gypsum price did not deviate from the price of 1926, ranging from $4 per ton in Ohio to $10 in Iowa and $11 in Washington. The price of agricultural gypsum, or land plaster, showed decreases in some markets; $0.50 to $1 per ton in Seattle, Wash., and as much as $5 per ton in San Francisco. The price of calcined stucco decreased in some parts of the country and increased in others. Keenes cement also fluctuated in price in several sections of the country; the average price, however, remained about the same.

Although the amount of gypsum building materials produced during 1927 increased slightly over that for the previous year the small let-up in building construction created stricter competition, which brought about a decrease in the prices as a whole.

Prices of some gypsum products in March, June, and December, 1927, appear in the accompanying table.

Gypsum prices, per short ton in carload lots, in 1927 [1]

District	Crushed rock			Ground gypsum			Agricultural gypsum			Stucco, calcined			Keenes cement		
	Mar. 5	June 11	Dec. 10	Mar. 5	June 11	Dec. 10	Mar. 5	June 11	Dec. 10	Mar. 5	June 11	Dec. 10	Mar. 5	June 11	Dec. 10
Douglas, Ariz.	-----	-----	-----	-----	-----	-----	$6.00	$6.00	$6.00	-----	-----	$14.50	$40.00	$40.00	$30.00
Los Angeles, Calif., and Arden, Nev.	$3.00	$3.00	$3.00	$8.00	$8.00	$8.00	8.00	8.00	8.00	$10.70	$10.70	10.70	-----	-----	-----
San Francisco, Calif.	-----	-----	-----	-----	-----	-----	11.65	11.65	9.00	13.40	13.40	13.40	-----	-----	-----
Centerville, Iowa	3.00	3.00	3.00	10.00	10.00	10.00	15.00	15.00	15.00	10.00	10.00	10.00	-----	-----	-----
Grand Rapids, Mich.	2.75	2.75	2.75	6.00	6.00	6.00	6.00	6.00	6.00	8.00	8.00	8.00	24.55	24.55	24.55
Gypsum, Ohio	3.00	3.00	3.00	4.00	4.00	4.00	6.00	6.00	6.00	8.00	8.00	7.00	27.00	27.00	24.50
Port Clinton, Ohio	3.00	3.00	3.00	4.00	4.00	4.00	6.00	6.00	6.00	10.00	10.00	10.00	30.15	30.15	30.15
Seattle, Wash.	6.40	6.60	6.00	11.00	10.00	10.50	11.00	10.00	10.50	13.00	13.00	13.00	-----	-----	-----
Winnipeg, Manitoba	5.00	5.00	5.00	5.00	5.00	5.00	7.00	7.00	7.00	13.00	13.00	13.00	-----	-----	-----

[1] Rock Products.

IMPORTS AND EXPORTS [1]

IMPORTS

More gypsum was imported in 1927 than in 1926 but the total value was considerably less. Imports of crude gypsum in 1927 amounted to 828,619 short tons, valued at $1,167,581, of which 757,785 tons, valued at $1,099,131, came from Canada; Mexico was the next largest source of supply, furnishing gypsum rock for an American plant in southern California. Imports of ground or calcined gypsum increased from 7,149 tons, valued at $99,058, in 1926, to 8,650 tons, valued at $114,947, in 1927, whereas the value of manufactured plaster of Paris fell from $96,355 in 1926 to $89,096 in 1927. Imports of Keenes cement increased from 578 tons, valued at $15,701, in 1926, to 655 tons, valued at $16,202, in 1927.

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[1] Figures on imports and exports (unless otherwise indicated) were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Figures on imports of gypsum and gypsum products, as recorded by the Bureau of Foreign and Domestic Commerce, are given in the two tables following:

Gypsum imported for consumption in the United States, 1918–1927

Year	Crude		Ground or calcined		Manufactured plaster of Paris	Keenes cement		Total value
	Short tons	Value	Short tons	Value		Short tons	Value	
1918	50, 653	$55, 004	6, 117	$70, 028	$1, 765	111	$2, 259	$129, 056
1919	171, 733	211, 946	10, 415	126, 405	7, 719	187	5, 984	352, 054
1920	282, 486	397, 942	14, 921	179, 191	10, 282	202	5, 338	592, 753
1921	266, 796	364, 318	4, 495	55, 109	33, 072	184	6, 836	459, 335
1922	409, 475	523, 939	1, 774	32, 651	55, 116	403	9, 636	621, 342
1923	448, 129	629, 203	5, 133	77, 716	41, 317	418	11, 543	759, 779
1924	519, 627	724, 864	5, 217	70, 793	48, 059	539	12, 042	855, 758
1925	634, 423	915, 888	10, 759	140, 941	56, 724	449	11, 294	1, 124, 847
1926	824, 081	1, 276, 131	7, 149	99, 058	96, 355	578	15, 701	1, 487, 245
1927	828, 619	1, 167, 581	8, 650	114, 947	89, 096	655	16, 202	1, 387, 826

Gypsum, crude, imported into the United States, 1925–1927, by countries

[General imports]

Country	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Algeria and Tunisia	4	$9	1	$10	2, 219	$5, 710
Belgium					220	543
Canada	617, 866	879, 477	728, 941	1, 044, 810	757, 785	1, 099, 131
Cuba	1	5	4, 480	7, 000		
France	1, 092	1, 621	12	64		
Germany			(1)	25	1	8
Hong Kong	6	95	8	281	6	114
Mexico	14, 858	33, 360	85, 306	217, 043	68, 387	62, 035
Sweden			2, 352	1, 959		
United Kingdom	596	1, 321	2, 981	4, 939	1	40
	634, 423	915, 888	824, 081	1, 276, 131	828, 619	1, 167, 581

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[1] Less than ½ ton.

Eight companies in the gypsum industry reported to the Bureau of Mines that they imported 785,476 short tons of crude gypsum in 1927. They were the Atlantic Gypsum Products Co. (one plant in New Hampshire and one plant in New York), Connecticut Adamant Plaster Co., Higginson Manufacturing Co., Newark Plaster Co., Pennsylvania Gypsum Co., Chas. W. Priddy & Co. (Inc.), Standard Gypsum Co. (Inc.) (one plant in California and one plant in Washington), and the United States Gypsum Co.

Of the gypsum imported in 1927 (as reported by these companies and shown in the table that follows), 107,307 tons were sold without calcining, as compared with about 60,000 tons in 1926, and nearly 586,000 tons, or about the same as in 1926, were sold calcined and used mainly in the manufacture of gypsum plasters. The total value of the imported gypsum sold by these eight firms without calcining and in manufactured form in 1927 was $6,889,590, in comparison with a business of $42,174,454 in domestic gypsum by all producers.

Foreign gypsum sold in the United States in 1927, by uses, as reported by eight importers

Use	Short tons	Value
Sold without calcining:		
To cement mills	73,239	$239,833
For agriculture	32,278	191,575
For other uses	1,790	26,339
	107,307	457,747
Sold calcined:		
Stucco	21,233	153,693
Neat plaster	323,865	2,461,297
Sanded plaster	56,562	389,715
Plaster of Paris	138,305	2,418,451
Partition tile	11,350	169,167
Other uses[1]	34,565	839,520
	585,880	6,431,843

[1] Includes dental plaster, plaster board, wall board, roof tile, insulating, and fireproofing.

EXPORTS

Exports of gypsum are designated by the Bureau of Foreign and Domestic Commerce as "gypsum or plaster, crude, ground, calcined, and manufactures of," and have been as follows: 1927, 18,429 short tons, valued at $471,106; 1926, 19,610 tons, $576,585; 1925, 16,798 tons, $498,616; 1924, 10,623 tons, $358,425; 1923, 8,815 tons, $226,423; 1922, 7,673 tons, $178,166. Exports are not separately classified for earlier years.

GENERAL SURVEY

NEW COMPANIES AND CORPORATIONS

The number of new companies and corporation changes during 1927 was not as large as in former years, only 10 incorporation notices (including increase of capital by going concerns) being noted. The total new capital represented was $14,545,000, most of which was covered by capital increases of concerns already in the field. This figure compares with about $20,000,000 for 1926. On the other hand, considerable money was expended by active concerns during the year on plant improvements but did not find its way into the financial records outside of the companies concerned, the new financing being carried on within.

The Schumacher Wall Board Corporation (Seattle, Wash., plant) combined with the Western Wallboard Co. to form the Gypsum Products Corporation.

The Beaver Products Co. of Virginia (Inc.) acquired the plant and holdings of the Southern Gypsum Co., North Holston, Va., on January 1, 1927, by direct purchase for a reported price of $750,000.

The Tidewater Gypsum Co. was incorporated toward the end of the year to work a salt-dome deposit near Houston, Tex.[2] The deposit which is to be developed and worked does not at all resemble the great gypsum deposits in the western part of the State. It is on top of a salt dome, such as has been successfully drilled for oil at a number of places in the Texas coastal plain. The presence of gypsum has been known there for a considerable time, but the deposit has not been worked because it is difficult to obtain the land in an oil country, and, moreover, a great deal of water has been encountered in previous attempts to work salt-dome gypsum deposits. Core drillings have shown that the gypsum is 900 feet thick and lies 132 feet below the surface. Above it is a strong cap rock which will make a good roof for mining operations. Samples from the shaft being sunk show from 98 to 99 per cent plus of gypsum with less than 1 per cent of anhydrite. A modern plant is to be erected to manufacture wall board, plaster, and other gypsum products; the company expects to sell large quantities of crude gypsum to the cement plants in the vicinity.

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[2] Rock Products, Mar. 3, 1928.

Plans have been completed for the erection of a gypsum-products plant by the United States Phosphoric Products Co., at Tampa, Fla.[3] The new plant will be housed in a steel and concrete building 80 by 150 feet. The equipment includes several 1,000-ton steel storage bins, electric cranes, rotary dryer, calciner, block machines, and bagging equipment. The company has available for the manufacture of plaster and gypsum blocks a large supply of raw material derived as a by-product from the manufacture of triple superphosphate at Tampa.

New gypsum companies were incorporated in Oklahoma, Texas, Montana, and Utah, but little of their intentions could be learned. Once again, as many times in the past, claims have been filed on part of the extensive gypsum sands near Alamogordo, N. Mex. According to newspaper reports the interested parties have investigated fully fuel and power costs, transportation to manufacturing centers, and other details and are reasonably satisfied that the enterprise has commercial possibilities.

Other projects reported under way include a new distributing warehouse on the municipal pier at Pensacola, Fla., by the Gulf Gypsum Co., at which barges could be unloaded for rail shipment to other points.

PLANT INCREASES

Many companies carried out extensive plant improvements, principally toward increasing capacity.

The Beaver Products Co. (Inc.) installed what is reputed to be the largest wall-board dryer in the world at its Akron (N. Y.) plant and made other general changes. The entire plant has been practically rebuilt in modern fireproof construction, and new kettles have been installed. At the Gypsum (Ohio) mill the steam-boiler unit was discontinued, a program of electrification having been completed during the year. The North Holston (Va.) plant (formerly the Southern Gypsum Co.) was improved and enlarged.

The New York City plant, Atlantic Gypsum Products Co., which was damaged by fire in September, is being repaired and the company is making improvements and additions by which the capacity will be increased about 50 per cent. New crushing, grinding, calcining, and mixing equipment is being installed, and the plant is expected to resume operations early in 1928.

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[3] Rock Products, May 26, 1928.

A new $40,000 warehouse for gypsum products was completed in September, 1927, by the Rumford Chemical Works, Rumford, R. I.

The Structural Gypsum Co. has completed improvements at its Akron (N. Y.) plant and is now making plans for the erection of a new plant at Linden, N. J., for the manufacture of a diversified line of gypsum products from synthetic gypsum. Three Butterworth & Lowe improved return four-flue, 10-foot diameter kettles will be installed in this new plant.

The burned portion of the Grand Rapids (Mich.) mill of the Michigan Gypsum Co. is being rebuilt, and an unconfirmed report states that the Grand Rapids Plaster Co. is contemplating the operation of the Grandville (Mich.) plant.

Two new 8-foot diameter kettles of Butterworth & Lowe design are to be installed at the Joliet (Ill.) plant of the Calumet Chemical Co.; this operation makes blocks of synthetic gypsum from the waste of baking powder manufacture.

The United States Gypsum Co. completed many improvements scheduled in 1926, among which were the new wall-board plant at New Brighton, N. Y., said to be one of the largest in the country, a $1,000,000 paper mill at Kansas City, Mo., and a $40,000 factory branch and warehouse at Philadelphia. Three vessels, the *Gypsum King*, the *Gypsum Queen*, and the *Gypsum Prince*, especially designed for gypsum carrying, were put into operation by the company and will be operated between the Windsor (Nova Scotia) quarries and the New Brighton (N. Y.) mill. The company is reported to be planning improvements to its Loveland (Colo.) plant, which will cost about $300,000, and new mills at Midland, Calif., and River Rouge, Mich. The No. 6 mine at Plasterco, Va., one of the deepest gypsum mines in the world, the shaft extending 560 feet down, was reopened during the latter part of 1927.

The United States Gypsum Co., Chicago, Ill., purchased 5¼ acres of deep-water harbor frontage at Charlestown, Mass., from the Boston & Maine Railroad. The company will soon begin erection of a $1,500,000 plant, which will employ 300 to 500 men and produce 1,000 tons of fireproof building material daily. The plant to be erected will cover 4 acres and have 10 or 12 buildings of the latest first-class fireproof type. New dock facilities will be built to enable the gypsum company with its own steamers to deliver raw gypsum from its quarries in Nova Scotia and New Brunswick direct to the plant. This plant, which will be in operation within a year, will make gypsum wall board, partition tiling, wall plaster, and high-grade molding and specialty plasters for direct shipment to New England consumers.

The Schumacher plant of the Gypsum Products Corporation, at Seattle, Wash., is being remodeled, and about $30,000 in new machinery is being installed. As soon as the improvements are completed the entire production will be centered in this plant and the Western Wallboard Co. plant discontinued. The improved plant will be modern in every detail and is expected to have a capacity of about 6,000,000 square feet of wall board and gypsum lath per month.

The Buttress Manufacturing Co., Los Angeles, Calif., it is reported, has expended over $25,000 in new drying equipment in order to bring up its production.

A new dryer was installed at the Plastoid Products Co. (Inc.) mill at Los Angeles.

A new $150,000 mill will replace the recently burned plaster plant of the Pacific Portland Cement Co., Consolidated. The new plant is built of concrete and steel and will have a capacity of 300 tons per day, or 35 per cent more than the plant which was burned.

The Standard Gypsum Co. (Inc.) has installed a new partition-tile plant at Seattle and is contemplating building a wall-board plant. The company also improved its unloading facilities at Slip No. 1, Long Beach, Calif., at a cost of $10,000.

The Universal Gypsum & Lime Co., Chicago, has completed several improvements to its plants at Fort Dodge, Iowa, Akron, N. Y., and Rotan, Tex.

The Universal Gypsum & Lime Co., of Chicago, in 1927 took over the properties of the Higginson Manufacturing Co., consisting of the gypsum plant at Newburgh, N. Y., 270 acres of land at Windsor, Nova Scotia, containing large amounts of gypsum rock, and an interest in the lime plant at Ossining, N. Y. The mill at Newburgh is on the Hudson River, where its 1,000 feet of water front offers excellent facilities for delivery by water to the metropolitan district of New York and to steamship piers for export. The property is directly between the river and the West Shore Railroad. This company is said to be the pioneer in importing Nova Scotia gypsum for manufacturing plasters in the United States. In obtaining the Higginson properties the Universal company has rounded out a complete line of gypsum products. It now manufactures every gypsum product used in the building industry, including gypsum wall board, block, tile, "Insulex" (a light-weight gypsum product), and finishing, molding, and cement plasters.

NEW PRODUCTS

Because of the keen competition in the making of standard gypsum products manufacturers have striven to introduce special products. The year 1927 brought forth a number of new gypsum products, many of which are closely identified with the individual manufacturer producing them—an excellent safeguard which appears to have a profitable future.

The United States Gypsum Co. has brought out the "U. S. G. system of sound insulation" that includes the use of a gypsum product called "Sabinite" in the treatment of walls, ceilings, floors, columns, piping vents, and mechanical equipment. The system is fitted to the individual job, and selling and installation are carried on by a special division of the company. The company has also introduced a "Structolite" load-bearing tile that has hollow cores and is designed for the erection of exterior walls and bearing partitions in residences, garages, and other lightly constructed buildings. It is designed to withstand loads of 1,000 pounds per square inch and can be nailed and sawed. It is made in the following sizes: 8 by 8 by 16 inches; 8 by 6 by 16 inches; 8 by 12 by 16 inches; and 6 by 12 by 16 inches. A special cement, "Setfast," is now put out by the same company and is used for laying up gypsum partition tile. Still another of its products, bundled "Rocklath," is put up in two sizes, 16 by 48 inches and 16 by 32 inches.

Acoustic plaster is now being marketed by the Standard Gypsum Co. (Inc.) under the trade name of "Calacoustic." Other companies have brought out plasters for the same purpose or are engaged in developing them.

Gypsum lath is now a product made by practically every wallboard manufacturer, the Gypsum Products Corporation making it a specialty. Locklath, a new type of gypsum lath manufactured by the Plastoid Products Co. (Inc.), Los Angeles, Calif., is a tongue-and-groove lath with a gypsum core, covered with asphalt-treated paper; the lath has one smooth face and one dovetailed grooved face to provide additional bond for the plaster.

The Beaver Products Co. (Inc.) has acquired the patent rights to "Thermocrete," a cellular gypsum product for home use over ceilings and as inside wall insulation, floor fill, and roof-deck insulation in hotel, office, and industrial buildings. The company has also obtained the United States patent rights for the manufacture of "Elo" panels, an English wall board of asbestos, gypsum, and other products. These panels have been used with success in European countries, and a plant for their manufacture will be established at Buffalo, N. Y.

FUTURE OF THE INDUSTRY

The gypsum-manufacturing industry has made its greatest growth within the last decade. The development has been rapid, extensive, and possibly beyond present requirements, but probably not inconsistent with the greatly increased consumption which is bound to come as the public learns more about the characteristics and quality of gypsum and its numerous uses. This knowledge must be fostered from within the industry. The present status of the gypsum industry presents problems akin to those facing the cement industry some 20 years ago—ample producing capacity with a market which needed awakening. A point of similarity between the two industries is the early concentration of the cement industry in certain districts—something that has been largely outgrown at present. The opinion of some observers seems to be that there are too many gypsum plants in the East, with resulting concentration on a narrow geographical market, and shipments farther afield limited by freight rates. A more forward-looking view would not, however, be blind to the fact that large cities, such as New York, Philadelphia, and Boston, could use gypsum products so much more extensively than at present that the plants now supplying the Atlantic coast district would be taxed to capacity.

According to current opinions from producers future efforts of the gypsum industry should be devoted to the development of new products for the construction trades. These include such items as reinforced roofing and pre-cast units, stress being laid on the desirable fireproofing and insulating qualities. The demand for gypsum-concrete units for use in the proper places could be stimulated, particularly for roofs, nonbearing fire walls, fire stops, etc. One company is ready to bring out novelties, such as toilet seats, made of a gypsum combination.

There is opportunity for a great extension in the sale of gypsum for agricultural purposes, not only as a fertilizer but also as a mash ingredient and a sanitary and disinfectant agent for use around poultry houses. The Gypsum Industries (Inc.), the national association of gypsum producers, has done much to promote the use of gypsum in agriculture, and this field should offer unlimited possibilities. Gypsum is a comparatively cheap source of two of the most important chemical elements in all organic life—both plant and animal—calcium and sulphur.

Research for a method of weatherproofing calcined gypsum should be encouraged, for a good process would open a large market for gypsum products to be used in exterior construction.

SYNTHETIC GYPSUM

The following paragraphs are abstracted from an article in Rock Products, issues of Feb. 19 and April 16, 1927.

Every year, according to authoritative estimates, chemical manufacturers in the United States produce between 400,000 and 500,000 tons of synthetic calcium sulphate which has heretofore been wasted. This comes largely from the phosphate-fertilizer industry and alkali manufacture, although no inconsiderable proportion comes from other industries such as manufacture of phosphoric acid baking powders. Waste or by-product gypsum is of two general classes: (1) That derived from processes in which lime salts or minerals are treated with sulphuric acid to produce other acids—as, for example, in the production of phosphoric acid from rock or bone phosphate; and (2) the processes in which free sulphuric acid is neutralized with some form of lime salt. Both classes produce a residual precipitated hydrous or hemihydrous lime sulphate. About 85 per cent is produced in making phosphates or phosphoric acid and has been not only a waste but an expense and an annoyance where dumping spaces are limited.

The problem of conversion of this waste to useful and marketable material has been successfully solved, and at the present time (June, 1928) three companies are putting out tile made from synthetic gypsum. The process for treating the waste synthetic gypsum and converting it into a standardized marketable product has been worked out and consists of six definite steps:

1. Pumping the precipitated gypsum in slurry form into thickeners, which are used as storage for raw material supply.
2. Partial dewatering and washing of the gypsum slurry by passing over a continuous rotary filter.
3. Repulping the filter cake and neutralizing the phosphoric acid contained therein by stirring in agitators.
4. Dewatering and densifying the gypsum magma by centrifuging.
5. Calcining the semidried, purified, and densified gypsum into stucco or plaster of Paris.
6. Converting this stucco or plaster of Paris into neat plaster mixtures, sanded plaster mixtures, plaster blocks, or plaster board.

Washing alone does not take out the small amounts of free or partly combined phosphoric acid commonly present in waste gypsum, so neutralization with alkalies must be resorted to. This acid, unless removed, will appear in the calcined product and impart to it erratic setting and weakness. Although lime or lime hydrate is the cheapest neutralizer, it has a detrimental effect on synthetic gypsums, weakening the plaster and greatly retarding the set. After much experimentation the best neutralizers were found to be the soluble sodium carbonate or bicarbonate. The mixture of these salts with the waste gypsum gave a material having a brief staying set and rapid final set which was both stable and controllable, with an ultimate strength that was not reduced.

The calculated amount of salt is added to the gypsum magma in the repulper (step 3). The agitation brings about the desired neutralization and chemical change. The centrifuging or dewatering (step 4) causes a definite physical change, in that the gypsum crystals are formed.

The ordinary gypsum plant, producing 80 tons of plaster per 24-hour day from rock gypsum 2 inches in size, costs about $100,000, including equipment and bins. Figuring power consumed at 2 cents per kilowatt-hour, fuel coal at $5.50 per ton, labor at 50 cents per hour, rock gypsum delivered at the plant at $1.50 per ton, and an over-all depreciation at 15 per cent of the investment, it costs such a plant about $5.75 to produce 1 ton of stucco plaster. A 500-ton plant could cut this down to $5.18.

A plant that uses synthetic gypsum and has a capacity of 80 tons per 24-hour day costs about $80,000 to build and equip, and, operating under the same labor, fuel, and power conditions, can produce the plaster at a cost of about $3.75 per ton. The following figures are taken from the actual operating-cost data of a small plant producing 15 to 20 tons of calcined stucco plaster per day of 12 hours and include the preliminary processing of the by-product gypsum from phosphoric acid manufacture.

Cost analysis of producing 15½ tons of plaster (stucco)

Precipitated gypsum	No cost.
Labor (50 cents per hour)	$17. 55
Power (2 cents per kilowatt-hour)	14. 25
Fuel oil (14 gallons per ton of plaster), at $2.30 per barrel	11. 93
Supplies, chemicals, water, etc	5. 50
Repairs (labor and material)	4. 00
Overhead (taxes, supervision, insurance, office heat and light, etc.)	6. 00
Depreciation (7 per cent on plant cost; 2 per cent on building cost)	7. 50
Total cost	66. 73
Cost per ton	4. 30

The greatest saving in manufacture is in the preparation of the raw material. A plant using synthetic gypsum has no grinding to do; this item in the rock-gypsum plant amounts to as much as $2.50 per ton. The chemical and mechanical treatment in the synthetic gypsum plant costs less than $1 per ton. Further, some of the costs of handling the gypsum waste from phosphoric acid works can be charged directly to them, and this also cuts down the handling costs.

Calcination of synthetic gypsum proceeds in a similar manner to that in use in ordinary commercial practice. The only difference lies in the state of the material as introduced into the kettle. Rock gypsum is generally ground so that 95 per cent will pass through 100 mesh and, because of the load, the agitator requires a good deal of power. In some localities gypsite is calcined without previous drying, and trouble sometimes occurs in the kettle because the material sticks to the sides and bottom. In calcining the synthetic product no unusual power is consumed and there is no trouble with material sticking, although the moisture content is 15 to 25 per cent. The reasons advanced are: The material on discharge from the centrifuge is in an interstitially extended physical condition due to the shaving action of the discharging knife blade upon the compacted gypsum mass within the machine. In consequence, sticking of the kettle due to moisture is entirely eliminated, and the material calcines in three to four hours in a regular kettle without side scrapers. The calcination is under control, recording thermometers being used to indicate the time and temperature at which each charge has boiled to the first settling point and drawing off.

One particular plant found it advisable to use the gypsum so made in the manufacture of blocks because the plaster was gray from the presence of particles of finely divided carbon. The blocks sold at a price equal to that of the pure white, for plaster could be applied over them and color was therefore no objection. Manufacture is carried out as follows:

The plaster is gauged with the required amount of water and the mass poured into 70-foot rubber molding belts having a tongue-and-groove side. During the pouring the belts are reinforced along the entire length with shredded rattan fiber. The monolithic slab thus formed is run off and sawed into standard 30-inch blocks which are placed on cars and run through tunnel dryers for curing. This type of reinforced block, it is said, has the following advantages:

1. There is less breaking in handling, shipping, and on the job.
2. The solid block of synthetic gypsum gives greater insulation than a hollow rock gypsum block; the strength is increased about 50 per cent through reinforcement, and the weight is about equal to a hollow rock gypsum block of the same dimensions.
3. The tongue-and-groove feature makes a stronger wall with better alignment and at a lower cost for labor and mortar for erection.
4. Blocks can be laid without mortar, as this type of construction permits of nailing the blocks together.

The plant capacity is about 3,600 square feet of 2 and 3 inch block per 10-hour day, manufactured at a cost of about 5 cents per square foot (considering one-third of the output to be of 2-inch block and the remainder of 3-inch).

CANADA

PRODUCTION

The production of gypsum in Canada in 1927 for the first time in the history of the industry totaled more than 1,000,000 tons, when 1,063,117 short tons, valued at $3,251,015, were produced. American plants are using increasing quantities of Canadian gypsum, especially from Nova Scotia, New Brunswick, Manitoba, and Ontario.

Gypsum produced and sold in Canada, 1918–1927 [1]

[Figures cover lump, crushed, fine ground, and calcined gypsum]

Year	Short tons	Value	Year	Short tons	Value
1918	152, 287	$823. 006	1923	578, 301	$2, 243, 100
1919	299, 063	1, 215, 287	1924	646, 016	2, 208, 108
1920	429, 144	1, 893. 991	1925	740, 323	2, 389, 891
1921	386, 550	1, 785, 538	1926	883, 728	2, 770, 813
1922	559, 265	2, 160, 898	1927	1, 063, 117	3, 251, 015

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[1] Dominion Bur. Statistics.

NOTES ON CANADIAN PLANTS

The largest gypsum-products operator in Canada is the Canada Gypsum & Alabastine Co. (Ltd.), a recent combination of the Canada Gypsum & Alabastine Co., the Manitoba Gypsum Co., and the British Columbia Gypsum Co., which have wall-board and plaster plants at Montreal and Caledonia. The Montreal plant is quite recent and contains up-to-date equipment for the manufacture of light-weight gypsum wall board. The rock for manufacture is purchased in part from the Canada Cement Co., but the main sources of supply are the mines at or near Caledonia, Nova Scotia, and the quarry at Mabon, Nova Scotia, all owned and operated by the company.[4]

An interesting feature not common to plants in the United States (except those on the Pacific coast) is the production of wall board of many sizes and thicknesses. These sizes are all made on the same board machine and dryer, regulations of the equipment being changed for the size under manufacture. The export trade which takes a large part of the company's capacity demands the various sizes made, but especially the ¼-inch thickness. Shipments have been made to Vancouver by an all-water route through the Panama canal. Exports to New Zealand and Australia are made at regular periods.

The Caledonia operations of the Canada Gypsum & Alabastine Co. (Ltd.) are largely the results of a series of consolidations and purchases dating back to 1917, when the Alabastine Co. and the Crown Gypsum Co. merged to form the Ontario Gypsum Co. A mine had already been opened by the Alabastine Co. in 1905; some of the output was sold to cement plants and the rest shipped to the calcining plant of the parent company at Paris, Ontario. In 1920 the holdings of the Canadian Plaster Board Co. were acquired, and in 1925 those of the Ebsary Gypsum Co., leaving the Ontario Gypsum Co. the only operating company in all Ontario.

The Iona Consolidated Gypsum Corporation, of Iona, Nova Scotia, is reported as formulating plans for the production of wall board in 1929. It has a deposit of about 25,000,000 tons of rock gypsum at tidewater. This is worked by open-face quarrying; as the company expects an increased tonnage in 1928 it is improving facilities for shipping the crude rock by building a large breakwater.

Although gypsum has been found at many localities in the Province of Manitoba, it has been exploited only at Gypsumville, where large deposits occur northwest of the narrows of Lake St. Martin. Two varieties of gypsum occur—gypsum rock in beds seldom less than 3 inches thick and the fibrous satin-spar usually in beds from ¾ to 1 inch in thickness. Anhydrite is mixed with the gypsum, the percentage increasing with depth. Development started in 1901, when the Manitoba Union Mining Co. staked out some of the gypsum deposits and erected a small mill at Old Gypsumville on Lake Manitoba, 12 miles southwest of the present village. At that time there was no rail connection, and the calcined gypsum was shipped down the lake to Delta. Later a track was laid from the quarries to the lake, so that the gypsum could be freighted to the mill all the year. In 1904 the Manitoba Gypsum Co. purchased the Manitoba Union

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[4] Rock Products, Apr. 14, 1928.

Mining Co. The mill burned down in 1906, and a new mill was then put up at Winnipeg. For a time the raw gypsum was shipped by barge down the lake to Delta, thence by rail to Winnipeg, but in 1910 the Oak Point branch of the Canadian Northern Railway was extended to Gypsumville, and from that time shipments have been by rail only. In 1927 the Canada Gypsum & Alabastine Co. (Ltd.), of Paris, Ontario, purchased the business and the properties of the Manitoba Gypsum Co. (Ltd.), of Winnipeg, and its subsidiary, the British Columbia Gypsum Co. (Ltd.). The Manitoba company is one of the largest industrial establishments in Manitoba, owning large mills at St. James, near Winnipeg, and controlling the holdings of valuable gypsum lands at Gypsumville, Manitoba, noted above.

NATURAL GAS

By G. R. Hopkins and H. Backus

The history of the natural-gas industry in 1927 was similar to that of the petroleum industry in that a record output was marketed at reduced prices. The total quantity of natural gas produced in the United States and delivered to consumers in 1927 amounted to the huge total of 1,445,428,000,000 cubic feet, an increase over 1926 of 132,409,000,000 cubic feet, or 10 per cent; this increase compares with increases of 10 and 4 per cent in 1926 and 1925, respectively, over the preceding year. During 1927, 184,000,000 cubic feet of gas produced in the United States was piped to Canada and Mexico, and 1,445,244,000,000 cubic feet was consumed within the United States. The value of the gas per thousand cubic feet at the wells decreased from 9.5 cents in 1926 to 8.8 cents in 1927 and at points of consumption from 22.9 cents in 1926 to 22.0 cents in 1927. In spite of the material increase in quantity of gas utilized in 1927, the total value at wells and at points of consumption showed but slight increases over 1926.

In 1927 domestic (household) consumers—3,984,000—of natural gas in the United States used a total of 296,036,000,000 cubic feet. These figures represent an increase of nearly 254,000, or 7 per cent, in the number of domestic consumers, but an increase of only 2 per cent in the total domestic consumption. The average consumption in 1927 per domestic consumer, 74,300 cubic feet, as compared with 77,500 cubic feet in 1926, was lower for the fourth consecutive year; this decrease in average consumption was probably the result of more efficient use. The average price paid for natural gas by domestic consumers in 1927 was 60.8 cents per thousand cubic feet, as compared with 58.4 cents in 1926. As an illustration of the steady increase in the price paid by domestic consumers for gas, it may be cited that the 1927 price was almost twice the 1917 price, and that the last annual decrease in average price was in 1908. On the basis of the consumption and price data given, the natural-gas bill of the average domestic consumer in 1927 was $3.76 per month, or $45.17 for the year. Ohio continued to lead the States in number of domestic consumers and was again followed by California and Pennsylvania. California recorded the largest increase in number of domestic consumers in 1927 as well as the largest increase in average value. This unusual relation would seem to indicate that the price of natural gas for household use is a minor factor from the point of view of the consumer. Only three States—Indiana, Missouri, and Tennessee—reported a decrease in 1927 in number of domestic consumers.

The relative rank of the large natural-gas producing States was materially changed in 1927. Oklahoma retained first place, Texas advanced from fourth to second place, and Louisiana from fifth to fourth. California dropped from second to third place and displaced West Virginia which dropped to fifth place. The output in Oklahoma increased 14 per cent in 1927, chiefly as the result of production incidental to the intensive drilling for oil at Seminole. Texas showed the largest increase in output—45 per cent—of all the major gas-producing States; as in Oklahoma, this increase was due to oil development, particularly that in the Panhandle.

The total consumption of natural gas (including residue gas from natural gasoline plants) by industrial users in 1927 amounted to 1,149,208,000,000 cubic feet, an increase over 1926 of 12 per cent; this total was divided about equally between field use (that is, for drilling. pumping, and operating gasoline recovery plants) and other industrial uses (including gas burned in making carbon black and gas used by manufacturing establishments). Virtually all of the increase in consumption of gas for field purposes was in Oklahoma and Texas and was the result of an intensive drilling campaign in those States. The major part of the increase in consumption of gas for other industrial purposes was in Louisiana, where refiners were using it as fuel more extensively than in previous years, and in Texas where carbon black manufacturers in the Panhandle district and industrial plants in the Texas Gulf coast district were using it in increasing quantities. The total value of the gas consumed for field and other industrial purposes in 1927 amounted to $137,785,000, as compared with $131,185,000 in 1926. The average value per thousand cubic feet for industrial gas dropped from 12.8 cents in 1926 to 12 cents in 1927; this fact accounts for the small increase in total value in the face of a 12 per cent gain in consumption. In general, the price of gas for industrial purposes has shown little change in the past 10 years, whereas, as previously noted, the price of gas for domestic consumption has increased steadily. This condition is due mainly to the fact that the fields near the centers of population have declined in output and the only prolific gas fields found in the past several years are in comparatively isolated localities.

Despite the low prices that prevailed for natural gasoline in 1927, the tendency to extract the greatest possible amount from the gas was again marked. A total of 1,341,248,000,000 cubic feet of natural gas, or 93 per cent of the total production, was treated for the recovery of natural gasoline in 1927. In 1926 the proportion treated was 92 per cent.

The interstate movement of natural gas in 1927 amounted to 194,401,000,000 cubic feet, a decrease of 7 per cent from 1926. The movement of gas from West Virginia continued to be of first importance despite a decrease of 13 per cent from 1926; this decrease was probably due to both declining production in West Virginia and slow but steady increase in the output of Ohio.

Summary of statistics for natural gas in the United States, 1923-1927

	1923	1924	1925	1926	1927
Natural gas consumed:					
Domestic............millions of cubic feet..	277, 050	285, 152	272, 146	289, 175	296, 036
Industrial—					
Carbon black.......................do....	109, 096	156, 514	140, 366	130, 321	144, 087
Field.......................................do....	343, 076	393, 437	423, 524	478, 188	549, 455
Other industrial.........................do....	277, 745	306, 379	352, 403	415, 169	455, 666
	1, 006, 967	1, 141, 482	1, 188, 439	1, 312, 853	1, 445, 244
Domestic..............................per cent..	27. 5	25	23	22	20
Industrial...................................do....	72. 5	75	77	78	80
Treated for natural gasoline:					
Millions of cubic feet..............................	875, 711	1, 016, 276	1, 040, 390	1, 206, 300	1, 341, 248
Per cent of total consumption..................	87. 0	89	88	92	93
Domestic consumers..................thousands..	3, 234	3, 443	3, 508	3, 731	3, 984
Value of natural gas at wells:					
Total....................thousands of dollars..	100, 849	105, 779	112, 047	124, 693	127, 468
Average per M cubic feet...............cents..	10. 0	9. 3	9. 4	9. 5	8. 8
Value of natural gas at points of consumption:					
Total....................thousands of dollars..	239, 995	253, 830	265, 184	[1] 300, 055	317, 803
Domestic....................................do....	142, 317	154, 075	152, 494	[1] 168, 870	180, 018
Industrial....................................do....	97, 678	99, 755	112, 690	131, 185	137, 785
Average per M cubic feet—					
Domestic..............................cents..	51. 4	54. 0	56. 0	58. 4	60. 8
Industrial...............................do....	13. 4	11. 6	12. 3	12. 8	12. 0
Domestic and industrial.............do....	23. 8	22. 2	22. 3	22. 9	22. 0
Natural gasoline:					
Quantity................thousands of gallons..	816, 226	933, 861	1, 127, 470	1, 363, 090	1, 641, 144
Value at plants—					
Total...............thousands of dollars..	77, 268	82, 233	120, 383	136, 412	118, 688
Average per gallon...................cents..	9. 5	8. 8	10. 7	10. 0	7. 2
Carbon black:					
Quantity...............thousands of pounds..	138, 263	186, 872	177, 417	180, 576	198, 429
Value at plants—					
Total...............thousands of dollars..	11, 692	11, 565	9, 640	9, 939	10, 955
Average per pound...................cents..	8. 5	6. 2	5. 4	5. 5	5. 5

[1] Revised figures.

Natural gas produced and consumed in the United States, 1926–27

State	Produced and delivered to consumers, including deliveries in other States						Consumed, including receipts from other States			
	Quantity		Estimated value at the wells		Value at points of consumption		Quantity		Value at points of consumption	
	M cubic feet	Per cent of total	Total	Average per M cubic feet (cents)	Total	Average per M cubic feet (cents)	M cubic feet	Per cent of total	Total	Average per M cubic feet (cents)
1926										
Ark	43,566,000	3.3	$2,000,000	4.6	$5,817,000	13.4	52,630,000	4.0	$7,027.000	13.4
Calif	204,915,000	15.6	16,803,000	8.2	[1] 36,425.000	17.8	204,915,000	15.6	[1] 36,425,000	17.8
Colo	553,800	(2)	50,000	9.0	130,000	23.5	503.800	(2)	125,000	24.8
Ill	3.808,000	.3	762.000	20.0	863,000	22.7	3,808,000	.3	863,000	22.7
Ind	901,000	.1	377,000	41.8	379,000	42.1	1,854,000	.1	906,000	48.9
Kans	38,095,000	2.9	2,884,000	7.6	12,547,700	32.9	61,142,000	4.7	14,381,000	23.5
Ky	10,410,000	.8	961,000	9.2	3,378,000	32.4	18,126.000	1.4	6,119,000	33.8
La	157,423,000	12.0	4,864,000	3.1	8,768,000	5.6	148,886,000	11.3	6,912,000	4.6
Mich	400	(2)	40	10.0	200	50.0	400	(2)	200	50.0
Mo	1,000	(2)	100	10.0	700	70.0	5.819,000	.4	4,997.400	85.9
Mont	2,283,000	.2	86.000	3.8	450.000	19.7	3,295,000	.2	650.000	19.7
N. Mex	921.000	.1	72,000	7.8	75.000	8.1	921,000	.1	75,000	8.1
N. Y	[3] 7,027.000	.5	2,237,000	31.8	4.499,000	64.0	17,864.000	1.4	11,443,000	64.1
Ohio	47,363,000	3.6	8,781,000	18.5	25,403,000	53.6	115,719,000	8.8	65,982.000	57.0
Okla	286,421,000	21.8	22,828.000	8.0	42,140,000	14.7	244,993,000	18.7	33,251,000	13.6
Pa	107,089,000	8.2	25,112,000	23.4	50,040.000	46.7	125,836,000	9.6	56,724,000	45.1
S. Dak	10,100	(2)	1,010	10.0	14,000	138.6	10,100	(2)	14,000	138.6
Tenn	11,500	(2)	1,150	10.0	1,900	16.5	11,500	(2)	1,900	16.5
Tex	[4] 175,392,000	13.4	10,685,000	5.7	28,165,000	16.1	187,341,000	14.3	30,807,000	16.4
W. Va	180,223,000	13.7	24,582,000	13.6	76,396,000	42.4	72,784,000	5.5	18,337,000	25.2
Wyo	46,567,000	3.5	2,203,000	4.7	4,669,000	10.0	45,605,000	3.5	4,474,000	9.8
Other[5]	38,200	(2)	3,700	9.7	6,500	17.0	789,200	.1	540,500	68.5
	1,313,019,000	100.0	124,693,000	9.5	[1] 300,168,000	22.9	1,312,853,000	100.0	[1] 300,055,000	22.9
1927										
Ark	30,450,000	2.1	1,486,000	4.9	4,281,000	14.1	40,916,000	2.8	5,751,000	14.1
Calif	212,364,000	14.7	19,431,000	9.1	50,946,000	24.0	212,364,000	14.7	50,946.000	24.0
Colo	1,725,400	.1	173,000	10.0	290,000	16.8	1,544,000	.1	277,000	17.9
Ill	3,741,000	.3	678,000	18.1	764,000	20.4	3.741,000	.3	764,000	20.4
Ind	1,124,000	.1	406,000	36.1	509,000	45.3	2,166,000	.1	1,076,000	49.7
Kans	42,646,000	3.0	3,263,000	7.7	12,833,000	30.1	66,618,000	4.6	13,998,000	21.0
Ky	10,206,000	.7	946,000	9.3	3,277,000	32.1	16,694,000	1.2	5.608,000	33.6
La	186,961,000	12.9	5,609,000	3.0	12,158.000	6.5	170,310,000	11.8	9,340,000	5.5
Mich	600	(2)	50	8.3	300	50.0	600	(2)	300	50.0
Mo	300	(2)	30	10.0	200	66.7	6,584,300	.5	5,265,000	80.0
Mont	4,253,100	.3	131,800	3.1	716,400	16.8	5,455,000	.4	918,000	16.8
N. Mex	1,019,000	.1	45,000	4.4	48,500	4.8	1,019.000	.1	48,500	4.8
N. Y	[6] 5,908,000	.4	1,731,000	29.3	3,841,000	65.0	16,174,500	1.1	10,514.000	65.0
N. Dak	200	(2)	20	10.0	100	50.0	2.300	(2)	1,300	56.5
Ohio	51.381,000	3.5	8,632,000	16.8	28,881,000	56.2	112,603,000	7.8	64,258,000	57.1
Okla	326,864,000	22.6	21,508.000	6.6	41,391,000	12.7	286,485,000	19.8	33.503,000	11.7
Pa	105,709,500	7.3	26,502.000	25.1	49,135.000	46.5	121,982,000	8.4	54,473,000	44.7
S. Dak	92,000	(2)	8.130	8.8	136,500	148.4	92,000	(2)	136,500	148.4
Tenn	9.000	(2)	800	8.9	2,200	24.4	9,000	(2)	2,200	24.4
Tex	[7] 254,063,000	17.6	11,204,000	4.4	37,424,800	14.7	269,944,000	18.7	40,141,000	14.9
W. Va	162,375,000	11.2	23,918,000	14.7	67,994,000	41.9	66,200,000	4.6	17,082.000	25.8
Wyo	43,581,600	3.0	1,765,000	4.0	3,269,800	7.5	42,559,000	2.9	3,080,000	7.2
Other[5]	954,300	.1	30,170	3.2	31,200	3.3	1,781,300	.1	620,200	34.8
	1,445,428,000	100.0	127,468,000	8.8	317,930,000	22.0	1,445,244,000	100.0	317,803,000	22.0

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[1] Revised figures.
[2] Less than 0.1 per cent.
[3] Includes 79,000 M cubic feet consumed in Canada.
[4] Includes 87,000 M cubic feet consumed in Mexico.
[5] 1926: Alaska, Maryland (consumption only), and North Dakota; 1927: Alaska, Maryland (consumption only), Mississippi, and Utah.
[6] Includes 71,000 M cubic feet consumed in Canada.
[7] Includes 113,000 M cubic feet consumed in Mexico.

Natural gas consumed in the United States, 1926–27

State	Domestic				Industrial							
					Field (drilling, pumping, and operating gasoline recovery plants)		Other industrial, including use in manufacture of carbon black			Total industrial		
	Number of consumers	M cubic feet	Value at points of consumption		M cubic feet (estimated)	Value at points of consumption (estimated)	M cubic feet	Value at points of consumption		M cubic feet	Value at points of consumption	
			Total	Average (cents)				Total	Average (cents)		Total	Average (cents)
1926												
Arkansas	52, 210	7, 824, 000	$3, 532, 000	45. 1	35, 195, 000	$1, 615, 000	9, 611, 000	$1, 880, 000	19. 6	44, 806, 000	$3, 495, 000	7. 8
California	632, 600	20, 960, 000	[1] 15, 731, 000	75. 1	123, 953, 000	10, 177, 000	60, 002, 000	10, 517, 000	17. 5	183, 955, 000	20, 694, 000	11. 2
Colorado	1, 974	78, 800	68, 000	86. 3	378, 000	34, 000	47, 000	23, 000	48. 9	425, 000	57, 000	13. 4
Illinois	11, 910	203, 000	142, 000	70. 0	3, 605, 000	721, 000				3, 605, 000	721, 000	20. 0
Indiana	13, 860	722, 000	386, 000	53. 5	72, 000	30, 000	1, 060, 000	490, 000	46. 2	1, 132, 000	520, 000	45. 9
Kansas	142, 730	10, 133, 000	6, 905, 000	68. 1	11, 536, 000	873, 000	39, 473, 000	6, 603, 000	16. 7	51, 009, 000	7, 476, 000	14. 7
Kentucky	137, 500	12, 404, 000	5, 258, 000	42. 4	874, 000	81, 000	4, 848, 000	780, 000	16. 1	5, 722, 000	861, 000	15. 0
Louisiana	35, 710	4, 413, 000	1, 669, 000	37. 8	25, 763, 000	796, 000	118, 710, 000	4, 447, 000	3. 7	144, 473, 000	5, 243, 000	3. 6
Michigan	6	400	200	50. 0								
Missouri	100, 300	5, 288, 000	4, 843, 400	91. 6			531, 000	154, 000	29. 0	531, 000	154, 000	29. 0
Montana	6, 345	1, 383, 000	589, 000	42. 6	290, 000	11, 000	1, 622, 000	50, 000	3. 1	1, 912, 000	61, 000	3. 2
New Mexico	140	28, 000	5, 000	17. 9	893, 000	70, 000				893, 000	70, 000	7. 8
New York	235, 290	16, 909, 000	11, 004, 000	65. 1	491, 000	157, 000	464, 000	282, 000	60. 8	955, 000	439, 000	46. 0
Ohio	1, 124, 080	87, 672, 000	53, 970, 000	61. 6	3, 130, 000	580, 000	24, 917, 000	11, 432, 000	45. 9	28, 047, 000	12, 012, 000	42. 8
Oklahoma	166, 660	17, 617, 000	8, 840, 000	50. 2	159, 269, 000	12, 694, 000	68, 107, 000	11, 717, 000	17. 2	227, 376, 000	24, 411, 000	10. 7
Pennsylvania	599, 900	56, 148, 000	33, 912, 000	60. 4	7, 988, 000	1, 873, 000	61, 700, 000	20, 939, 000	33. 9	69, 688, 000	22, 812, 000	32. 7
South Dakota	375	10, 100	14, 000	138. 6								
Tennessee	80	5, 500	1, 300	23. 6	6, 000	600				6, 000	600	10. 0
Texas	279, 380	18, 045, 000	11, 986, 000	66. 4	69, 369, 000	3, 996, 000	99, 927, 000	14, 825, 000	14. 8	169, 296, 000	18, 821, 000	11. 1
West Virginia	165, 800	25, 700, 000	8, 166, 000	31. 8	14, 225, 000	1, 940, 000	32, 859, 000	8, 231, 000	25. 0	47, 084, 000	10, 171, 000	21. 6
Wyoming	11, 280	2, 880, 000	1, 314, 000	45. 6	21, 136, 000	1, 000, 000	21, 589, 000	2, 160, 000	10. 0	42, 725, 000	3, 160, 000	7. 4
Other [2]	12, 670	751, 200	534, 100	71. 1	15, 000	1, 400	23, 000	5, 000	21. 7	38, 000	6, 400	16. 8
	3, 730, 800	289, 175, 000	[1] 168, 870, 000	58. 4	478, 188, 000	36, 650, 000	545, 490, 000	94, 535, 000	17. 3	1, 023, 678, 000	131, 185, 000	12. 8

[1] Revised figures.

[2] Alaska, Maryland, and North Dakota.

Natural gas consumed in the United States, 1926–27—Continued

State	Domestic				Industrial							
					Field (drilling, pumping, and operating gasoline recovery plants)		Other industrial, including use in manufacture of carbon black			Total industrial		
	Number of consumers	M cubic feet	Value at points of consumption		M cubic feet (estimated)	Value at points of consumption (estimated)	M cubic feet	Value at points of consumption		M cubic feet	Value at points of consumption	
			Total	Average (cents)				Total	Average (cents)		Total	Average (cents)
1927												
Arkansas	57, 190	6, 419, 000	$2, 900, 000	45. 2	20, 876, 000	$1, 019, 000	13, 621, 000	$1, 832, 000	13. 4	34, 497, 000	$2, 851, 000	8. 3
California	745, 440	35, 309, 000	30, 125, 000	85. 3	121, 393, 000	11, 107, 000	55, 662, 000	9, 714, 000	17. 5	177, 055, 000	20, 821, 000	11. 8
Colorado	2, 050	179, 000	105, 000	58. 7	1, 203, 000	120, 000	162, 000	52, 000	32. 1	1, 365, 000	172, 000	12. 6
Illinois	12, 150	164, 000	116, 000	70. 7	3, 577, 000	648, 000				3, 577, 000	648, 000	18. 1
Indiana	13, 850	781, 000	415, 000	53. 1	97, 000	35, 000	1, 288, 000	626, 000	48. 6	1, 385, 000	661, 000	47. 7
Kansas	145, 960	10, 435, 000	6, 893, 000	66. 1	15, 811, 000	1, 210, 000	40, 372, 000	5, 895, 000	14. 6	56, 183, 000	7, 105, 000	12. 6
Kentucky	141, 880	11, 448, 000	4, 917, 000	43. 0	861, 000	80, 000	4, 385, 000	611, 000	13. 9	5, 246, 000	691, 000	13. 2
Louisiana	40, 480	4, 071, 000	1, 482, 000	36. 4	27, 672, 000	830, 000	138, 567, 000	7, 028, 000	5. 1	166, 239, 000	7, 858, 000	4. 7
Michigan	10	600	300	50. 0								
Missouri	99, 070	5, 359, 300	4, 841, 000	90. 3			1, 225, 000	424, 000	34. 6	1, 225, 000	424, 000	34. 6
Montana	7, 700	1, 775, 000	763, 000	43. 0	1, 203, 000	37, 000	2, 477, 000	118, 000	4. 8	3, 680, 000	155, 000	4. 2
New Mexico	140	21, 000	4, 500	21. 4	998, 000	44, 000				998, 000	44, 000	4. 4
New York	236, 890	15, 036, 000	10, 087, 000	67. 1	464, 500	14, 000	674, 000	413, 000	61. 3	1, 138, 500	427, 000	37. 5
North Dakota	30	2, 300	1, 300	56. 5								
Ohio	1, 149, 760	83, 654, 000	52, 038, 000	62. 2	3, 679, 000	618, 000	25, 270, 000	11, 602, 000	45. 9	28, 949, 000	12, 220, 000	42. 2
Oklahoma	193, 660	22, 298, 000	10, 532, 000	47. 2	204, 006, 000	13, 424, 000	60, 181, 000	9, 547, 000	15. 9	264, 187, 000	22, 971, 000	8. 7
Pennsylvania	610, 720	51, 794, 000	31, 389, 000	60. 6	7, 990, 000	2, 003, 000	62, 198, 000	21, 081, 000	33. 9	70, 188, 000	23, 084, 000	32. 9
South Dakota	400	92, 000	136, 500	148. 4								
Tennessee	70	9, 000	2, 200	24. 4								
Texas	328, 510	20, 517, 000	14, 019, 000	68. 3	103, 498, 000	4, 564, 000	145, 929, 000	21, 558, 000	14. 8	249, 427, 000	26, 122, 000	10. 5
West Virginia	171, 370	23, 406, 000	7, 673, 000	32. 8	15, 864, 000	2, 337, 000	26, 930, 000	7, 072, 000	26. 3	42, 794, 000	9, 409, 000	22. 0
Wyoming	12, 780	2, 638, 000	1, 070, 000	40. 6	20, 224, 000	819, 000	19, 697, 000	1, 191, 000	6. 0	39, 921, 000	2, 010, 000	5. 0
Other [3]	14, 290	627, 800	508, 200	80. 9	38, 500	3, 000	1, 115, 000	109, 000	9. 8	1, 153, 500	112, 000	9. 7
	3, 984, 400	296, 036, 000	180, 018, 000	60. 8	549, 455, 000	38, 912, 000	599, 753, 000	98, 873, 000	16. 5	1, 149, 208, 000	137, 785, 000	12. 0

[3] Alaska, Maryland, Mississippi, and Utah.

Interstate transportation of natural gas, in thousands of cubic feet, 1926–27

State in which gas was produced	State to which gas was transported	1926	1927
Colorado	Wyoming	50,000	181,400
Indiana	Kentucky	408,000	306,000
Kansas	Missouri	5,818,000	6,584,000
	Oklahoma	414,000	104,000
		6,232,000	6,688,000
Kentucky	West Virginia	1,595,000	1,955,000
Louisiana	Arkansas	8,063,000	10,215,000
	Mississippi	------------	14,000
	Texas	6,419,000	10,884,000
		14,482,000	21,113,000
Montana	North Dakota	------------	2,100
New York	Canada	79,000	71,000
	Pennsylvania	17,000	500
		96,000	71,500
Ohio	Indiana	1,361,000	1,348,000
	West Virginia	4,709,000	1,102,000
		6,070,000	2,450,000
Oklahoma	Arkansas	236,000	251,000
	Kansas	29,279,000	30,660,000
	Texas	12,327,000	9,572,000
		41,842,000	40,483,000
Pennsylvania	New York	10,933,000	10,338,000
	Ohio	1,429,000	1,698,000
	West Virginia	2,419,000	2,052,000
		14,781,000	14,088,000
Texas	Arkansas	765,000	------------
	Louisiana	5,945,000	4,462,000
	Mexico	87,000	113,000
		6,797,000	4,575,000
West Virginia	Kentucky	8,903,000	8,137,000
	Maryland	751,000	813,000
	Ohio	72,997,000	61,974,000
	Pennsylvania	33,511,000	30,360,000
		116,162,000	101,284,000
Wyoming	Montana	1,012,000	1,204,000
		209,527,000	194,401,000

Natural gas produced in the United States and delivered to consumers, 1918–1927, by States, in millions of cubic feet

Year	Arkansas	California	Illinois	Indiana	Kansas	Kentucky	Louisiana	Montana	New York	Ohio	Oklahoma	Pennsylvania	Texas	West Virginia	Wyoming	Others	Total	Value at points of consumption	
																		Total (thousands of dollars)	Average per M cubic feet (cents)
1918	5, 295	39, 719	4, 473	1, 667	27, 825	3, 022	36, 094	177	8, 461	61, 261	124, 317	123, 813	13, 440	265, 161	4, 339	1, 937	721, 001	153, 554	21. 3
1919	5, 587	55, 607	3, 825	1, 407	16, 150	2, 057	47, 062	858	8, 124	63, 153	163, 649	113, 489	24, 710	234, 095	6, 014	129	745, 916	160, 888	21. 6
1920	9, 027	66, 041	3, 013	1, 779	21, 158	3, 345	58, 274	818	8, 419	58, 938	154, 467	125, 787	37, 063	239, 719	10, 312	50	798, 210	196, 194	24. 6
1921	4, 260	75, 942	2, 646	1, 066	15, 717	4, 820	58, 004	336	6, 583	47, 412	124, 058	86, 144	44, 504	174, 921	15, 608	31	662, 052	174, 617	26. 4
1922	9, 700	84, 580	3, 383	947	20, 289	5, 872	70, 267	486	6, 947	51, 481	140, 631	101, 276	47, 945	195, 288	23, 427	27	762, 546	221, 535	29. 1
1923	24, 215	131, 434	4, 049	880	30, 913	11, 953	112, 031	1, 470	6, 497	53, 812	203, 082	112, 562	74, 535	203, 867	35, 523	153	1, 006, 976	240, 001	23. 8
1924	36, 616	189, 692	4, 072	998	25, 580	12, 875	160, 945	1, 071	6, 196	47, 396	214, 452	105, 863	107, 247	182, 285	46, 036	197	1, 141, 521	253, 856	22. 2
1925	41, 878	187, 789	4, 165	1, 168	26, 917	10, 770	152, 620	1, 496	6, 210	43, 235	249, 285	101, 632	134, 872	180, 345	45, 539	650	1, 188, 571	265, 271	22. 3
1926	43, 566	204, 915	3, 808	901	38, 095	10, 410	157, 423	2, 283	7, 027	47, 363	286, 421	107, 089	175, 392	180, 223	46, 567	1, 536	1, 313, 019	[1]300, 168	22. 9
1927	30, 450	212, 364	3, 741	1, 124	42, 646	10, 206	186, 961	4, 253	5, 908	51, 381	326, 864	105, 709	254, 063	162, 375	43, 582	3, 801	1, 445, 428	317, 930	22. 0

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[1] Revised figures.

Statistics of natural gas in the United States, 1918–1927

Year	Produced and delivered to consumers (billions of cubic feet)	Treated for recovery of natural gasoline		Domestic consumption					Industrial consumption					
		Billions of cubic feet	Per cent of total consumption	Number of consumers (thousands)	Billions of cubic feet	Average number of M cubic feet used per consumer	Per cent of total consumption	Average value at points of consumption per M cubic feet (cents)	Field (billions of cubic feet)	Carbon black (billions of cubic feet)	Other industrial (billions of cubic feet)	Total industrial (billions of cubic feet)	Per cent of total consumption	Average value at points of consumption per M cubic feet (cents)
1918	721	449	62	2,509	271	108.1	38	31.4	(1)	(1)	(1)	450	62	15.2
1919	746	480	64	2,501	256	102.2	34	34.6	170	50	270	490	66	14.8
1920	798	496	62	2,615	286	109.4	36	38.2	202	41	269	512	64	17.0
1921	662	465	70	2,631	248	94.4	38	44.4	182	51	181	414	62	15.5
1922	763	545	71	3,015	255	84.4	33	49.9	198	54	256	508	67	18.6
1923	1,007	876	87	3,234	277	85.7	28	51.4	343	109	278	730	72	13.4
1924	[2] 1,142	1,016	89	3,443	285	82.8	25	54.0	393	157	306	856	75	11.6
1925	[2] 1,189	1,040	88	3,508	272	77.6	23	56.0	424	140	352	916	77	12.3
1926	[2] 1,313	1,206	92	3,731	289	77.5	22	[3] 58.4	478	131	415	1,024	78	12.8
1927	[2] 1,445	1,341	93	3,984	296	74.3	20	60.8	549	144	456	1,149	80	12.0

[1] Figures not available.

[2] Includes gas piped to Canada and Mexico.

[3] Revised figures.

LIME

By A. T. Coons

SUMMARY

Sales of lime by producers in the United States in 1927 decreased 3 per cent in quantity and 7 per cent in value, compared with 1926. The quantity of lime for construction was 7 per cent less than in 1926, that for the manufacture of chemicals was practically the same as in 1926, and that reported for agricultural use was 9 per cent more than in 1926. Lime manufacturers reported generally poor demand and poor conditions in the lime trade; the latter part of 1927 was especially unfavorable to the industry. Most of the States showed decreased production. Ohio, the largest producing State, showed a decrease of 7 per cent in quantity, but Pennsylvania, which ranked second, showed an increase of 2 per cent. Both States showed decreased sales of building lime and increased sales of agricultural lime. Ohio showed a decrease in quantity of chemical lime sold, whereas Pennsylvania showed increased sales. The total number of plants (417) that reported operation in 1927 was 18 less than in 1926, largely because many field kilns, especially in Pennsylvania, were idle or abandoned. Labor conditions at the plants seemingly changed little during 1927, and wages and cost of materials were about the same as during 1926. There was keen competition among the large producers and a tendency to overproduction and lower prices. The average value, at the plants, of lime sold decreased from $9.11 a ton in 1926 to $8.75 a ton in 1927. The average value for building lime was 25 cents less per ton than in 1926, for chemical lime 39 cents less, and for agricultural lime 32 cents less.

The accompanying tables do not include a considerable amount of lime which is not a commercial product but is burned, for use in manufacturing, from stone either quarried or purchased by the manufacturer. This stone is reported to the bureau as raw limestone and is included in the statistics on stone. It is used mainly by alkali works, carbide works, sugar refineries, and smelters.

PRODUCTION

Lime sold by producers in the United States, 1918–1927

Year	Number of plants in operation	Short tons	Value [1]	
			Total	Average
1918	496	3, 206, 016	$26, 808, 909	$8. 36
1919	539	3, 330, 347	29, 448, 553	8. 84
1920	515	3, 570, 141	37, 543, 840	10. 52
1921	520	2, 532, 153	24, 895, 370	9. 83
1922	530	3, 639, 617	33, 255, 039	9. 14
1923	467	4, 076, 243	39, 993, 652	9. 81
1924	450	4, 072, 000	39, 596, 423	9. 72
1925	450	4, 580, 823	42, 609, 141	9. 30
1926	435	4, 560, 398	41, 566, 452	9. 11
1927	417	4, 414, 932	38, 638, 413	8. 75

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[1] The value given represents the value of bulk lime f. o. b. at point of shipment and does not include cost of barrel or package.

Lime sold by producers in the United States, 1926–27, by States

State	1926			1927		
	Number of plants in operation	Short tons	Value	Number of plants in operation	Short tons	Value
Alabama	11	220, 732	$1, 721, 558	10	206, 010	$1, 566, 287
Arizona	3	42, 757	421, 549	3	41, 859	390, 074
Arkansas	5	31, 346	275, 935	4	35, 375	307, 335
California	9	67, 421	800, 089	8	64, 934	708, 010
Colorado	4	12, 470	127, 975	4	11, 900	125, 875
Connecticut	6	61, 742	695, 495	6	53, 304	608, 550
Florida	4	9, 424	100. 241	3	5, 317	59, 491
Georgia	1	18, 526	141, 257	1	13, 533	99, 604
Hawaii	1	5, 717	102, 063	1	5, 679	95, 857
Idaho	2	(1)	(1)	2	(1)	(1)
Illinois	12	103, 180	1, 013, 740	10	115, 803	1, 084, 093
Indiana	7	126, 005	970, 624	8	116, 171	830, 527
Iowa	2	(1)	(1)	2	(1)	(1)
Kentucky	3	8, 550	55, 663	3	6, 862	47, 620
Louisiana	1	(1)	(1)	----------	----------	----------
Maine	4	128, 120	1, 615, 776	5	116, 566	1, 230, 356
Maryland	10	63, 639	524, 242	8	55, 405	439, 457
Massachusetts	10	202, 065	2, 653, 746	10	189, 343	2, 325, 031
Michigan	8	107, 671	995, 123	8	101, 172	931, 597
Minnesota	4	28, 522	296, 068	3	(1)	(1)
Missouri	15	263, 467	2, 218, 943	15	267, 776	2, 189, 420
Montana	3	8, 099	64, 916	3	11, 607	90, 512
Nevada	1	23, 162	239, 469	1	(1)	(1)
New Jersey	1	(1)	(1)	2	(1)	(1)
New Mexico	3	2, 032	20, 479	3	2, 042	20, 480
New York	12	107, 326	1, 016, 647	14	98, 071	905, 116
North Carolina	2	(1)	(1)	1	(1)	(1)
Ohio	31	1, 056, 589	10, 348, 880	31	987, 726	9, 497, 324
Oklahoma	1	257	2, 185	2	(1)	(1)
Oregon	2	785	13, 930	3	1, 105	21, 350
Pennsylvania	133	794, 196	6, 303, 312	122	813, 571	6, 105, 241
Porto Rico	14	7, 116	130, 872	14	7, 516	116, 618
Rhode Island	1	2, 857	42, 535	1	2, 937	43, 342
South Dakota	2	(1)	(1)	2	(1)	(1)
Tennessee	13	173, 363	1, 319, 303	11	181, 385	1, 266, 326
Texas	6	78, 293	706, 153	6	80, 796	733, 678
Utah	10	29, 953	348, 509	10	48, 882	397, 088
Vermont	10	56, 378	677, 944	10	61, 024	683, 440
Virginia	31	188, 696	1, 453, 095	28	178, 426	1, 317, 581
Washington	4	23, 783	298, 014	4	23, 959	382, 294
West Virginia	9	267, 464	1, 719, 590	12	244, 950	1, 643, 109
Wisconsin	23	216, 414	1, 896, 772	22	197, 667	1, 733, 009
Wyoming	1	(1)	(1)	1	30	600
Undistributed	----------	22, 281	233, 760	----------	66, 229	642, 121
	435	4, 560, 398	41, 566, 452	417	4, 414, 932	38, 638, 413

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[1] Included under "Undistributed."

Lime sold by producers in the United States, 1926–27, by uses

Use	Quantity		Value	
	Percentage of total	Short tons	Total	Average
1926				
Agricultural	6.5	297,010	$2,153,233	$7.25
Building	50.9	2,320,323	23,227,034	10.01
Chemical:				
Glass works	1.8	84,263	713,321	8.47
Metallurgy	9.0	408,234	2,860,338	7.01
Paper mills	9.3	423,322	3,492,996	8.25
Refractory lime (dead-burned dolomite)	8.5	386,715	3,593,731	9.29
Sugar refineries	.3	15,379	238,188	15.49
Tanneries	1.5	66,536	584,296	8.78
Other uses [1]	12.2	558,616	4,703,315	8.42
Total chemical	42.6	1,943,065	16,186,185	8.33
	100.0	4,560,398	41,566,452	9.11
Hydrated lime (included in above totals)	35.2	1,606,811	15,182,460	9.45
1927				
Agricultural	7.3	322,893	2,237,871	6.93
Building	48.7	2,148,840	20,962,759	9.76
Chemical:				
Glass works	1.8	78,994	665,026	8.42
Metallurgy	9.2	406,063	2,640,658	6.59
Paper mills	9.7	429,606	3,413,030	7.94
Refractory lime (dead-burned dolomite)	8.5	374,415	3,459,803	9.24
Sugar refineries	4	16,086	235,555	14.64
Tanneries	1.4	63,666	501,442	7.88
Other uses [1]	13.0	574,369	4,522,269	7.87
Total chemical	44.0	1,943,199	15,437,783	7.94
	100.0	4,414,932	38,638,413	8.75
Hydrated lime (included in above totals)	36.2	1,596,906	14,581,695	9.13

[1] Details of distribution shown in following table.

It is necessary to classify much material as "unspecified," because many of the manufacturers do not report the uses of that part of their lime which they sell for chemical purposes. This lime is known to be applied to several of the uses enumerated, but the following figures are the best available:

Chemical lime sold by producers in the United States for "other uses," 1926–27

Use	1926		1927	
	Short tons	Value	Short tons	Value
Alcohol manufacture and dehydration	3, 295	$28, 150	2, 199	$14, 554
Alkali works (ammonia, soda, potash)	26, 549	203, 692	19, 610	146, 532
Bleaching powder	5, 864	46, 735	5, 723	43, 541
Bleach. liquid	9, 581	99, 218	10, 308	92, 863
Calcium acetate	7, 128	56, 665	9, 618	73, 887
Calcium carbide	22, 285	177, 100	27, 037	188, 613
Coke and gas manufacture (gas purification and plant by-products)	26, 678	200, 614	29, 988	215, 562
Creameries and dairies	2, 719	43, 427	(1)	(1)
Disinfectants (chloride of lime, etc.)	5, 432	42, 875	(1)	(1)
Flour mills	527	5, 275	(1)	(1)
Glue	11, 120	92, 771	7, 864	65, 224
Insecticides (spraying materials)	14, 558	141, 108	22, 154	197, 581
Oil and fat manufacture	4, 809	44, 984	3, 899	38, 311
Oil refining	(1)	(1)	7, 101	69, 266
Paint (kalsomine, whitewash, varnish, etc.)	2, 156	20, 355	5, 050	42, 820
Rubber	3, 542	39, 727	4, 192	40, 455
Salt refining	1, 722	14, 241	1, 210	10, 139
Sand-lime and slag brick	39, 821	388, 166	43, 064	349, 430
Sanitation (sewage and garbage purification, etc.)	2, 731	23, 328	2, 416	15, 853
Silica brick	14, 881	123, 207	15, 638	120, 541
Soap	15, 906	107, 390	25, 487	161, 548
Textiles	1, 133	11, 869	1, 128	11, 697
Water purification	139, 478	1, 185, 670	124, 212	1, 039, 351
Wood distillation	12, 225	101, 749	11, 682	85, 046
Undistributed [2]	43, 580	342, 679	42, 973	348, 951
Unspecified	140, 896	1, 162, 320	151, 816	1, 150, 504
	558, 616	4, 703, 315	574, 369	4, 522, 269

[1] Included under "Undistributed."

[2] 1926: Lime used in acid neutralization and drying, artificial silk, asphalt and pottery filler, baking powder, bichromate refining, buffing compounds, corn products, cyanide manufacture, dyes, explosives, food products, gelatin (edible), magnesia, oil refining, oxygen purification, and tobacco. 1927: Lime used in acid neutralization and drying, acetic acid, asphalt and fertilizer filler, bichromate refining, buffing compounds, calcium phosphate, cellulose, corn products, creameries and dairies, cyanide manufacture, disinfectants (chloride of lime, etc.), dyes, flour mills, food products, gelatin (edible), magnesia, oxygen purification, retarder, and stock food.

Lime sold by producers in the United States in 1927, by States and uses

State	Building		Agricultural		Chemical												Total	
					Glass works		Paper mills		Sugar refineries		Tanneries		Metallurgy		Other chemical uses			
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	58,453	$468,826	(1)	(1)			20,968	$147,271	(1)	(1)			88,858	$667,489	37,480	$281,199	206,010	$1,566,287
Arizona	20,046	223,662			290	$4,727					45	$540	19,169	127,292	2,309	33,853	41,859	390,074
Arkansas	13,402	130,339					19,904	155,285							2,069	21,711	35,375	307,335
California	46,794	522,973	1,385	$10,140			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	8,815	90,572	64,934	708,010
Colorado	5,783	63,295											(1)	(1)	(1)	(1)	11,900	125,875
Connecticut	46,472	557,904	4,501	29,664			(1)	(1)							(1)	(1)	53,304	608,550
Florida	5,317	59,491															5,317	59,491
Georgia	13,255	97,491	278	2,113													13,533	99,604
Hawaii	536	11,867	983	10,590					4,160	$73,400							5,679	95,857
Idaho	(1)	(1)	(1)	(1)			(1)	(1)									(1)	(1)
Illinois	63,550	661,525					11,996	96,816			7,423	64,050	3,617	28,552	29,217	233,150	115,803	1,084,093
Indiana	13,614	102,404	12,554	41,672	1,860	16,869	39,978	267,939	(1)	(1)	(1)	(1)	5,698	40,699	39,259	334,171	116,171	830,527
Iowa	(1)	(1)													(1)	(1)	(1)	(1)
Kentucky	(1)	(1)	(1)	(1)			(1)	(1)			(1)	(1)	(1)	(1)	(1)	(1)	6,862	47,620
Maine	60,631	765,760	11,969	55,341			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	116,566	1,230,356
Maryland	7,418	52,681	47,792	385,777									(1)	(1)	(1)	(1)	55,405	439,457
Massachusetts	150,123	1,994,883	4,937	30,109			15,526	133,186	(1)	(1)	(1)	(1)	(1)	(1)	17,406	152,111	189,343	2,325,031
Michigan	12,086	107,591	300	2,700			78,254	723,687			(1)	(1)	(1)	(1)	9,328	86,355	101,172	931,597
Minnesota	(1)	(1)					(1)	(1)					(1)	(1)	(1)	(1)	(1)	(1)
Missouri	101,763	929,260	1,205	10,263			18,381	144,935			2,384	20,615	27,456	189,949	116,587	894,398	267,776	2,189,420
Montana	2,683	38,721							(1)	(1)			8,897	51,660	(1)	(1)	11,607	90,512
Nevada	(1)	(1)													(1)	(1)	(1)	(1)
New Jersey	(1)	(1)	(1)	(1)													(1)	(1)
New Mexico	542	5,480													1,500	15,000	2,042	20,480
New York	31,613	257,052	3,957	36,384	(1)	(1)	15,622	162,430	(1)	(1)	3,929	41,692	12,209	125,905	30,540	279,777	98,071	905,116
North Carolina	(1)	(1)									(1)	(1)					(1)	(1)
Ohio	693,044	6,767,828	28,019	192,714	74,579	623,688	26,963	201,255	(1)	(1)	(1)	(1)	13,129	101,886	151,990	1.609,936	987,726	9,497,324
Oklahoma	(1)	(1)													(1)	(1)	(1)	(1)
Oregon	1,005	19,950													100	1,400	1,105	21,350
Pennsylvania	273,750	2,259,108	147,975	1,063,842	739	6,133	46,525	337,865	155	1,190	22,277	165,394	88,421	490,016	233,729	1,781,693	813,571	6,105,241
Porto Rico	351	3,359	702	5,176					6,417	107,664					46	419	7,516	116,618
Rhode Island	2,208	36,211	652	5,868							1	17			76	1,246	2,937	43,342
South Dakota	(1)	(1)	(1)	(1)									(1)	(1)	(1)	(1)	(1)	(1)
Tennessee	71,591	631,699	601	3,839			54,712	287,831	1,000	8,340	5,017	32,023	87	524	48,377	302,070	181,385	1,266,326

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[1] Included under "Undistributed."

Lime sold by producers in the United States in 1927, by States and uses—Continued

State	Building		Agricultural		Chemical												Total	
					Glass works		Paper mills		Sugar refineries		Tanneries		Metallurgy		Other chemical uses			
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Texas	50, 174	$462, 418	(1)	(1)	(1)	(1)	(1)	(1)	606	$5, 532	--------	--------	7, 859	$55, 108	19, 035	$181, 590	80, 796	$733, 678
Utah	9, 331	130, 335	(1)	(1)	--------	--------	(1)	(1)	--------	--------	--------	--------	39, 327	263, 787	114	1, 479	48, 882	397, 088
Vermont	33, 971	437, 894	4, 486	$18, 261	--------	--------	9, 860	$100, 880	--------	--------	2, 506	$26, 377	5, 357	50, 232	4, 844	49, 796	61, 024	683, 440
Virginia	75, 926	615, 131	30, 674	207, 063	--------	--------	8, 645	60, 558	(1)	(1)	7, 812	52, 372	(1)	(1)	51, 648	359, 493	178, 426	1, 317, 581
Washington	14, 983	263, 338	--------	--------	--------	--------	3, 958	57, 166	(1)	(1)	--------	--------	(1)	(1)	1, 755	28, 017	23, 959	382, 294
West Virginia	32, 348	230, 388	18, 079	110, 779	890	$7, 040	203	1, 133	250	1, 765	5, 178	35, 275	67, 834	275, 874	120, 168	980, 855	244, 950	1, 643, 109
Wisconsin	187, 927	1, 600, 225	--------	--------	--------	--------	7, 259	65, 553	--------	--------	200	1, 800	41	155	2, 240	65, 276	197, 667	1, 733, 009
Wyoming	30	600	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	30	600
Undistributed	48, 120	453, 070	1, 844	15, 576	636	6, 569	50, 852	469, 240	3, 498	37, 664	6, 894	61, 287	18, 104	171, 530	20, 152	196, 505	66, 229	642, 121
	2, 148, 840	20, 962, 759	322, 893	2, 237, 871	78, 994	665, 026	429, 606	3, 413, 030	16, 086	235, 555	63, 666	501, 442	406, 063	2, 640, 658	948, 784	7, 982, 072	4, 414, 932	38, 638, 413

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[1] Included under "Undistributed."

BUILDING LIME

There was a decrease in output of lime for construction in almost all the States; the few increases were of no special significance. Ohio and Pennsylvania are the largest producers of lime for building, but sales for this purpose from these States decreased 8 and 6 per cent, respectively, in 1927 from 1926, following decreases of 4 and 7½ per cent, respectively, in 1926 from 1925. Thirty-two per cent of the construction lime sold by producers in the United States in 1927 came from Ohio; 97 per cent of this output was hydrated lime, a part of which was high-grade finishing lime. The sales from Ohio, classified according to kinds of lime, are given in the following table:

Lime sold by Ohio producers for construction, 1925–1927

	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Quicklime	34,601	$274,853	26,735	$209,460	21,750	$160,168
Hydrated lime	750,845	7,662,264	726,803	7,220,340	671,294	6,607,660
	785,446	7,937,117	753,538	7,429,800	693,044	6,767,828

Of the hydrated lime sold by producers in the United States in 1927, Ohio produced 702,246 tons (7 per cent less than in 1926), or 44 per cent. Of this total 671,294 tons (96 per cent) was sold for construction and was widely distributed throughout continental United States. Figures of distribution, as reported to the Bureau of Mines, presented for blocks of contiguous States roughly comprising various freight-rate zones are given in the next table. It is possible that some of the lime reported as supplied to the district including Ohio is reshipped by dealers.

Shipments of hydrated lime from plants in the United States and in Ohio, 1926–27, by destinations

Destination	From all plants		From Ohio plants		
	Short tons	Distribution (per cent)	Short tons	Distribution (per cent)	Group total (per cent)
1926					
Illinois, Indiana, Michigan, Ohio	449,503	28.0	349,777	46.5	77.8
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	[1] 630,474	39.2	258,126	34.3	40.9
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	67,709	4.2	20,963	2.8	31.0
Florida, Georgia, North Carolina, South Carolina, Virginia	[1] 170,006	10.6	61,771	8.2	36.3
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	72,254	4.5	21,204	2.8	29.3
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	167,265	10.4	34,730	4.6	20.8
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	41,348	2.6	3,461	.4	8.4
Undistributed and exports	8,252	.5	2,732	.4	33.1
	1,606,811	100.0	752,764	100.0	46.8

[1] Revised figures.

Shipments of hydrated lime from plants in the United States and in Ohio, 1926–27, by destinations—Continued

Destination	From all plants		From Ohio plants		
	Short tons	Distribution (per cent)	Short tons	Distribution (per cent)	Group total (per cent)
1927					
Illinois, Indiana, Michigan, Ohio	443,670	27.8	338,469	48.2	76.3
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	649,564	40.7	252,455	35.9	38.9
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	73,046	4.6	22,046	3.1	30.2
Florida, Georgia, North Carolina, South Carolina, Virginia	140,001	8.8	35,642	5.1	25.5
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	75,911	4.7	20,244	2.9	26.7
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	157,794	9.9	28,016	4.0	17.8
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	46,837	2.9	2,031	.3	4.3
Undistributed and exports	10,083	.6	3,343	.5	33.2
	1,596,906	100.0	702,246	100.0	44.0

CHEMICAL LIME

The quantity of lime used in the manufacture of chemicals, as reported by lime producers, was practically the same in 1927 as in 1926; the value, however, decreased 5 per cent. There were some increases and some decreases in the quantities used in the chief chemical activities as well as in the minor uses; reported sales for the latter are apt to vary on account of incompleteness of classification. (See tables, pp. 141 and 142.)

AGRICULTURAL LIME AND OTHER LIMING MATERIALS

Notwithstanding reports by producers that inclement weather and floods, especially in the Central States, lessened the demand for agricultural lime, sales in 1927, as reported by the producers, increased 9 per cent in quantity and 4 per cent in value over 1926. Production of agricultural lime, as well as the output of pulverized limestone used for agricultural purposes, has in general increased since 1924. Output of the latter product in 1927 increased 19 per cent in quantity and 10 per cent in value compared with 1926. There was a large increase in the quantity of lime reported as burned from oyster shells and used for liming land, but sales of calcareous marl, of which all but a negligible quantity sold as a filler was used for agriculture, decreased 4 per cent in quantity. The table following gives available data on the quantity and value of different kinds of liming materials sold by producers in 1926 and 1927. The method by which the effective lime content of the different forms of land lime is calculated was set forth in Mineral Resources for 1921.

Agricultural lime and other liming materials sold by producers in the United States, 1926–27, by kinds

Kind	Short tons		Value	
	Gross	Effective lime content	Total	Average
1926				
Lime from limestone:				
Quicklime	112, 717	94, 600	$687, 661	$6. 10
Hydrated	184, 293	129, 000	1, 465, 572	7. 95
Lime from oyster shells	11, 984	10, 000	77, 428	6. 46
Limestone (pulverized)	1, 850, 620	796, 000	3, 064, 235	1. 66
Calcareous marl	55, 060	23, 700	146, 094	2. 65
1927				
Lime from limestone:				
Quicklime	107, 866	90, 530	615, 789	5. 71
Hydrated	215, 027	150, 500	1, 622, 082	7. 54
Lime from oyster shells	22, 081	18, 400	175, 234	7. 94
Limestone (pulverized)	2, 206, 470	949, 000	3, 360, 704	1. 52
Calcareous marl	52, 962	22, 800	180, 166	3. 40

The figures in the preceding table do not include calcareous marl used for the manufacture of cement; they represent the output of fresh-water marl, chiefly for agriculture. The chief producing States are Virginia, with 24,225 short tons in 1927, valued at $77,851, and West Virginia. The other States producing in 1927 were California, Illinois, Maine, Maryland, New York, North Carolina, Ohio, South Carolina, Utah, and Wisconsin.

HYDRATED LIME

The statistics of the output of hydrated lime include only the product made in hydrating machines; they exclude hand-slaked lime. In 1927 there was a decrease of less than 1 per cent in the quantity but of 4 per cent in value of hydrated lime sold by producers, as compared with 1926. Increased sales of hydrated lime were reported for agriculture and chemicals, but decreased sales for construction.

Hydrated lime sold by producers in the United States, 1918–1927

Year	Number of plants in operation	Short tons	Value	
			Total	Average
1918	90	620, 216	$5, 342, 113	$8. 61
1919	93	777, 408	7, 061, 146	9. 08
1920	98	853, 116	9, 287, 562	10. 89
1921	105	792, 970	7, 421, 637	9. 36
1922	114	1, 106, 063	9, 868, 980	8. 92
1923	121	1, 225, 928	12, 229, 598	9. 98
1924	120	1, 316, 664	13, 199, 846	10. 03
1925	134	1, 560, 848	15, 287, 461	9. 79
1926	147	1, 606, 811	15, 182, 460	9. 45
1927	157	1, 596, 906	14, 581, 695	9. 13

Hydrated lime sold by producers in the United States, 1926–27, by States

State	1926		1927	
	Short tons	Value	Short tons	Value
Alabama	29,791	$256,818	31,055	$232,466
California	9,294	122,135	11,965	148,326
Florida	6,017	63,008	3,809	38,458
Georgia	17,705	135,780	13,173	96,683
Hawaii	3,888	68,813	4,865	81,073
Illinois	26,549	254,304	29,909	269,241
Indiana	46,332	398,682	44,183	375,238
Maryland	36,624	316,013	28,747	240,838
Massachusetts	19,005	164,058	19,955	165,249
Michigan	15,468	183,566	17,303	202,812
Missouri	83,451	790,531	84,402	752,280
Nevada	3,091	44,865	(1)	(1)
New York	36,193	311,613	37,842	311,733
Ohio	752,764	7,399,770	702,246	6,832,732
Pennsylvania	237,066	2,061,741	264,491	2,147,828
Rhode Island	593	5,337	652	5,868
Tennessee	52,190	464,494	57,609	480,129
Texas	33,443	318,981	33,749	326,903
Vermont	9,731	90,732	10,571	128,443
Virginia	62,191	531,023	64,132	509,822
West Virginia	42,164	307,227	44,646	295,772
Wisconsin	15,458	171,322	13,698	161,617
Undistributed [2]	67,803	721,647	77,904	778,184
	1,606,811	15,182,460	1,596,906	14,581,695

[1] Included under "Undistributed."

[2] 1926: Arizona, Arkansas, Colorado, Connecticut, Kentucky, Maine, Minnesota, Montana, New Jersey, North Carolina, Utah, and Washington. 1927: Same States as in 1926, with Nevada in addition.

Hydrated lime sold by producers in the United States, 1926–27, by uses

Use	1926		1927	
	Short tons	Value	Short tons	Value
Agricultural	184,293	$1,465,572	215,027	$1,622,082
Building	1,189,239	11,463,100	1,125,802	10,566,601
Chemical:				
Glass works	3,626	34,304	3,069	30,426
Metallurgy	7,638	75,324	15,237	157,877
Paper mills	32,867	340,698	38,017	386,902
Sugar refineries	5,939	87,276	7,870	111,117
Tanneries	24,037	219,016	23,196	195,323
Other uses	159,172	1,497,170	168,688	1,511,367
Total chemical	233,279	2,253,788	256,077	2,393,012
	1,606,811	15,182,460	1,596,906	14,581,695

KILN CAPACITY AND FUELS

Reports were received by the Bureau of Mines from 417 active lime-manufacturing plants in 1927. Of this total, 123 plants were run by the operator for lime for local sale or for use on his farm. The output of these 123 plants in 1927 amounted to 30,222 tons, or less than 1 per cent of the total production; neither the capacity of these plants nor the number of kilns represented is known, but these factors are negligible compared with the total. In addition to these plants, three producers, operating plants chiefly for dead-burned dolomite and fluxing stone, did not give definite information relative to capacity, kilns, and fuel. The remaining 291 plants, with 2,009 kilns (of which 1,546 were in operation some part of the year), produced about 95 per cent of the total output of lime in 1927. The total capacity of these 291 plants was reported as about 24,000 tons a day, and the capacity of the active kilns as about 18,400 tons a day. According to the figures reported, the 291 plants, if worked at total capacity for 300 days, would produce about 7,200,000 tons of lime a year, or about 1.6 times the present output, and the active kilns would produce nearly one-third more than the actual production of these kilns in 1927. Very few of the kilns were operated continuously in 1927; besides time lost for necessary repairs and recharging, many of the plants were closed for extended periods during the year.

In the last few years there has been a general tendency in the lime industry to rebuild old plants; many hydrators have been installed, and old-type kilns have been torn down or abandoned to make room for kilns that could produce better lime with less outlay for labor and fuel; usually the capacity of such plants has been increased. New plants have also been constructed. Rotary kilns have been installed to care for the small stone produced at the quarry.

The number, capacity, and type of kilns operated and the number of kilns using different kinds of fuels, reported by 291 lime plants producing in 1927, were as follows:

Total number of kilns		2,009
Number of active kilns		1,546
Total capacity of plants	tons per day	24,000
Capacity of active kilns	do	18,400

Number of pot kilns	308
Number of shaft or vertical kilns	1,192
Number of rotary kilns	39
Number of field kilns	7
	1,546

Number of kilns using—	
Coal—	
Anthracite	82
Bituminous	767
Lignite	18
	867
Coal and wood	110
Coal and coke	69
Coke	121
Producer gas	109
Natural gas	27
Wood (including shavings, etc.)	199
Oil	44
	1,546

The unit quantity of the different fuels required to burn a unit quantity of lime varies greatly and depends on the quality of fuel, type and condition of kiln, and method of treatment. In plants using anthracite the ratio in 1927 was 1 pound of fuel to 3.5 to 6.5 pounds of lime, and the average was about 1 to 4. In plants using bituminous coal the ratio was 1 pound of fuel to 2 to 5 pounds of lime, and the average was 1 to 3 or 3.5. In plants using other fuels the ratio was as follows: 1 pound of coke to 3.5 to 4.6 pounds of lime; 1 cord of wood to 1.2 to 2.5 tons of lime; and 1 barrel of oil to 1,200 to 2,000 pounds of lime.

EXPORTS AND IMPORTS[1]

Lime exported from the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	7,191	$105,803	1923	11,789	$170,289
1919	6,372	108,370	1924	14,905	212,340
1920	5,921	128,296	1925	14,800	218,696
1921	5,192	109,769	1926	12,960	191,768
1922	8,289	116,649	1927	15,478	210,977

Lime exported from the United States, 1926–27, by countries

Country	1926		1927	
	Short tons	Value	Short tons	Value
North America:				
Canada	6,129	$75,550	8,260	$98,124
Central America—				
British Honduras	(a)	2		
Costa Rica	6	132		
Guatemala	90	2,035	3	96
Honduras	159	3,016	218	3,400
Nicaragua	91	2,947	76	1,910
Panama	285	6,146	93	2,291
Salvador	2	50	91	2,235
Mexico	2,902	25,951	3,082	29,858
Newfoundland and Labrador	1	44		
West Indies—				
British—				
Bermuda			(a)	10
Jamaica	64	1,826	147	2,840
Trinidad and Tobago	6	99		
Other British	74	1,533	3	74
Cuba	310	5,286	283	5,424
Dominican Republic	1,163	19,248	927	12,782
Haiti			1	69
Virgin Islands of the United States	61	1,749	86	2,531
South America:				
Argentina	5	117	(a)	26
Brazil			20	738
Chile	17	224	221	2,391
Colombia	193	5,697	158	3,770
Ecuador			1	22
Guiana—				
British	2	95	21	384
Surinam (Netherland)	23	667	2	37
Peru	548	11,137	519	9,146
Venezuela	10	287	117	2,368
Europe:				
Netherlands	112	11,257		
Sweden	24	950	28	1,060
United Kingdom	2	100	91	5,104
Asia:				
Japan, including Chosen	62	3,037	84	3,812
Philippine Islands	615	12,460	913	19,149
Africa:				
British—				
South, Union of			(a)	38
West			3	91
Liberia			2	50
Oceania:				
Australia	3	98	8	190
French Oceania	1	25	15	784
New Zealand			5	160
Other	(a)	3	(a)	13
	12,960	191,768	15,478	210,977

[a] Less than 1 ton.

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[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Lime imported for consumption in the United States, 1918–1927 [1]

Year	Short tons	Value	Year	Short tons	Value
1918	6, 650	$73, 458	1923	25, 407	$428, 903
1919	8, 679	128, 519	1924	20, 480	377, 994
1920	22, 688	392, 137	1925	15, 323	285, 599
1921	10, 811	234, 798	1926	18, 702	346, 969
1922	14, 112	290, 845	1927	19, 567	356, 836

[1] Most of the lime imported into the United States comes from Canada.

SHIPMENTS

Shipments of lime, as reported to the Bureau of Mines by the producers, have been combined to show the movement of this product to destinations in State groups which approximately comprise various freight-rate zones. The results of the compilation for the years 1926 and 1927 are given in the following table:

Lime shipped in the United States, 1926–27, by destinations, in short tons

Destination	1926			1927		
	Hydrated lime	Quick-lime	Total	Hydrated lime	Quick-lime	Total
Illinois, Indiana, Michigan, Ohio	449, 503	[1] 720, 159	[1]1,169,662	443, 670	650, 163	1, 093, 833
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	[1] 630, 474	[1]1,076,591	[1]1,707,065	649, 564	1, 036, 069	1, 685, 633
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	67, 709	234, 995	302, 704	73, 046	219, 818	292, 864
Florida, Georgia, North Carolina, South Carolina, Virginia	[1] 170, 006	[1] 135, 434	[1] 305, 440	140, 001	125, 452	265, 453
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	72, 254	[1] 289, 922	[1] 362, 176	75, 911	264, 208	340, 119
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	167, 265	[1] 287, 285	[1] 454, 550	157, 794	300, 541	458, 335
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	41, 348	195, 653	237, 001	46, 837	207, 506	254, 343
Undistributed and exports	8, 252	[1] 13, 548	[1] 21, 800	10, 083	14, 269	24, 352
	1, 606, 811	2,953,587	4, 560, 398	1, 596, 906	2, 818, 026	4, 414, 932

[1] Revised figures.

SAND AND GRAVEL

By Estelle R. Phillips[1]

PRODUCTION

The sand and gravel reported as sold or used by producers in the United States in 1927 amounted to 197,454,269 short tons, valued at $115,529,786, an increase of 8 per cent in quantity and 4 per cent in value, as compared with 1926, and exceeding in both quantity and value that reported for any previous year. The large increases in paving and road-making sand and gravel and in that used for railroad ballast were far more than sufficient to offset decreases in building sand and gravel, glass sand, molding sand, cutting and grinding sand (including blast sand), fire or furnace sand, and filter sand.

The total quantity of sand in 1927 amounted to 93,588,339 tons and was valued at $54,291,398, an increase of 2 per cent in quantity but a decrease of 2 per cent in value, as compared with 1926. The total gravel in 1927 amounted to 103,865,930 tons, valued at $61,238,388, an increase of 14 per cent in quantity and 10 per cent in value, as compared with 1926.

Seven States produced more than 11,800,000 tons each in 1927; New York led, with 19,896,766 tons, and Illinois, Michigan, California, Pennsylvania, Ohio, and Indiana followed in order. In each of these seven States the production was valued at more than $5,550,000 and in both New York and Pennsylvania at more than $12,000,000. New York led with a total value slightly in excess of Pennsylvania; Illinois was third, and Ohio, California, Michigan, and Indiana followed in order. Some of the State totals given on pages 160 and 161 show noticeable changes from the quantity and value given for these States for 1926. The changes are due to the great variation in the quantity and value of material reported by railroads and by State, county, and town highway departments.

More than 151,000,000 tons of sand and gravel was reported as washed and screened in 1927, as compared with 140,000,000 tons in 1926. In both years the washed and screened material was approximately 76 per cent of the total production.

The total output of sand and gravel in 1927 was the product of approximately 2,400 plants and pits. Each of nine States produced from more than 100 plants and pits, in the following order: Illinois, New York, Pennsylvania, Michigan, Ohio, California, Indiana, Wisconsin, and New Jersey.

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[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Sand and gravel sold or used by producers in the United States in 1926, by States and uses

State	Glass sand		Molding sand		Building sand		Paving sand		Grinding and polishing sand		Fire or furnace sand		Engine sand	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama			27, 279	$26, 560	388, 053	$123, 181	433, 965	$249, 061	(1)	(1)	(1)	(1)	(1)	(1)
Arizona					(1)	(1)	(1)	(1)						
Arkansas	(1)	(1)	(1)	(1)	82, 012	49, 442	92, 602	55, 083					(1)	(1)
California	2, 075	$3, 089	31, 201	60, 876	4, 064, 984	2, 441, 016	2, 125, 932	1, 185, 573	21, 648	$24, 043	(1)	(1)	52, 319	$22, 093
Colorado			(1)	(1)	178, 734	135, 252	88, 912	66, 732	(1)	(1)			31, 914	19, 125
Connecticut			2, 359	3, 182	300, 282	242, 829	75, 029	37, 586	1, 532	10, 250				
Delaware			18, 805	27, 282	13, 041	8, 163	40, 554	20, 277					(1)	(1)
District of Columbia					(1)	(1)	(1)	(1)						
Florida					1, 026, 818	640, 325	517, 917	294, 427					(1)	(1)
Georgia	(1)	(1)	56, 000	11, 950	238, 316	101, 737	375, 629	169, 269	(1)	(1)	14, 037	$4, 059	24, 449	6, 418
Idaho					(1)	(1)								
Illinois	610, 234	465, 458	779, 452	596, 295	4, 001, 642	1, 894, 939	2, 477, 058	1, 068, 209	350, 038	727, 774	80, 807	45, 410	111, 363	61, 065
Indiana	(1)	(1)	758, 548	356, 921	1, 692, 039	615, 565	1, 318, 694	584, 816	(1)	(1)	(1)	(1)	210, 114	53, 200
Iowa			27, 843	23, 259	634, 062	354, 341	524, 761	235, 285	(1)	(1)	(1)	(1)	43, 091	30, 225
Kansas			(1)	(1)	1, 145, 136	660, 164	633, 316	379, 840					142, 998	72, 300
Kentucky	(1)	(1)	29, 790	38, 047	705, 848	695, 877	226, 882	179, 118	(1)	(1)	(1)	(1)	23, 553	20, 922
Louisiana					387, 921	228, 013	206, 572	114, 354					(1)	(1)
Maine					(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)
Maryland	(1)	(1)	(1)	(1)	534, 384	306, 589	1, 391, 391	907, 549					(1)	(1)
Massachusetts	(1)	(1)	46, 110	42, 941	1, 310, 571	1, 237, 918	199, 733	220, 813	8, 841	13, 941	(1)	(1)	47, 648	43, 157
Michigan	(1)	(1)	695, 172	363, 208	2, 335, 137	1, 157, 675	2, 416, 444	926, 733	(1)	(1)			1, 198	407
Minnesota			17, 066	12, 917	830, 316	368, 739	447, 480	161, 181	3, 275	5, 340	1, 000	750	31, 866	10, 860
Mississippi					122, 416	75, 039	76, 304	28, 283					42, 552	11, 982
Missouri	145, 383	204, 067	86, 035	60, 362	1, 022, 297	595, 522	1, 135, 697	670, 516	142, 354	122, 947			25, 422	17, 526
Montana					19, 501	14, 791							13, 817	1, 500
Nebraska			(1)	(1)	569, 003	244, 750	81, 350	34, 134					(1)	(1)
Nevada			(1)	(1)	(1)	(1)	8, 105	5, 535						
New Hampshire					15, 593	15, 593	193, 347	194, 955						
New Jersey	185, 581	308, 507	468, 757	633, 554	1, 548, 018	743, 659	1, 005, 136	534, 004	88, 346	241, 147	50, 083	68, 320	69, 358	28, 423
New Mexico			140	100	19, 972	15, 042	18, 867	13, 477					10, 404	7, 548
New York	(1)	(1)	671, 748	1, 171, 821	8, 400, 733	3, 598, 672	3, 575, 118	2, 048, 996	10, 160	6, 488	24, 300	20, 220	118, 056	62, 899
North Carolina					609, 507	191, 217	336, 155	113, 190					36, 114	10, 845
North Dakota					15, 215	7, 888	(1)	(1)						
Ohio	(1)	(1)	758, 394	1, 089, 564	2, 950, 790	1, 863, 809	1, 378, 080	921, 245	56, 525	204, 687	80, 683	160, 472	161, 646	129, 299
Oklahoma	35, 695	61, 881			349, 756	203, 654	256, 697	154, 546	(1)	(1)			30, 351	19, 018
Oregon					501, 484	304, 907	136, 795	97, 899	(1)	(1)			(1)	(1)
Pennsylvania	409, 067	819, 981	631, 066	878, 798	3, 994, 121	3, 036, 082	2, 294, 898	1, 592, 072	614, 684	938, 045	61, 207	92, 433	319, 645	317, 823
Rhode Island			(1)	(1)	(1)	(1)	34, 891	6, 514						
South Carolina					81, 738	37, 680	109, 366	48, 468					(1)	(1)
South Dakota					55, 673	33, 880	111, 649	13, 936					(1)	(1)
Tennessee			8, 371	6, 522	517, 723	457, 924	252, 508	195, 613	(1)	(1)	460	460	31, 869	27, 869

Texas	6,071	4,157	385	690	943,122	421,838	462,421	225,845					48,670	20,943
Utah					103,249	42,089	63,606	26,863					39,550	17,402
Vermont			(1)	(1)	1,696	2,035	(1)	(1)	(1)	(1)			2,250	900
Virginia	(1)	(1)	13,774	17,433	347,850	172,812	301,752	145,440	10,102	6,154	(1)	(1)	160,257	75,302
Washington			700	2,800	511,882	280,932	438,237	208,437					43,765	13,940
West Virginia	518,128	1,134,017	21,162	43,738	391,039	392,571	300,288	298,597	(1)	(1)	(1)	(1)	227,650	194,300
Wisconsin			115,321	98,953	2,024,997	631,077	1,102,028	368,705	(1)	(1)	(1)	(1)	46,500	8,800
Wyoming					(1)	(1)	(1)	(1)						
Undistributed [2]	361,984	614,214	43,688	63,026	310,841	246,247	210,832	167,730	521,710	203,698	121,964	68,843	207,010	134,535
	2,274,218	3,615,371	5,309,166	5,630,799	45,327,512	24,891,475	27,476,998	14,970,906	1,859,215	2,504,514	434,541	460,967	2,355,399	1,440,626
Average value		1.59		1.06		0.55		0.54		1.35		1.06		0.61

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[1] Included under "Undistributed."

[2] Includes items entered as "(1)."

Sand and gravel sold or used by producers in the United States in 1926, by States and uses—Continued

State	Filter sand		Other sands		Building gravel		Paving gravel		Railroad ballast gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama			(1)	(1)	258,149	$136,069	654,946	$634,342	649,800	$73,015	2,417,161	$1,245,210
Arizona					(1)	(1)	(1)	(1)			392.351	113,906
Arkansas			32,781	$9,834	75,250	81,212	217,929	110.567	972,248	466,820	1,529,484	847,579
California	1,415	$4,676	(1)	(1)	3,098,910	2,478,951	2,821,921	2,179,780	677,708	276,051	13,164,670	8,820,047
Colorado			(1)	(1)	139,557	132,304	229,159	176.814	(1)	(1)	764,523	590,695
Connecticut			511,587	51,150	123,021	86,722	30,730	17,850	15,016	1,500	1,059,556	451,069
Delaware	(1)	(1)			(1)	(1)					83,325	61,186
District of Columbia					(1)	(1)	(1)	(1)			561,688	583,080
Florida					170,213	404,738	99,015	134,035	(1)	(1)	1.841,009	1,483,757
Georgia			(1)	(1)			(1)	(1)	(1)	(1)	839,459	343,322
Idaho					14,255	4,414	53.267	25,710	(1)	(1)	225,345	58,985
Illinois	3,860	12,489	2,491,415	801,122	2,721,005	1,213,051	2,667,220	1,370,726	1,483,075	457,812	17,777,169	8,714,350
Indiana			1,897,298	218,121	988,709	604,844	2,220,951	1,634.682	2,754,475	1,081,621	12,009,308	5,194,448
Iowa	5,400	8,064	59,939	23,104	307,610	282,125	661,782	430,777	381,525	164,771	2,694,751	1,569,006
Kansas	(1)	(1)	(1)	(1)	83,149	38,583	283,285	278,616	(1)	(1)	2,489,343	1,491,492
Kentucky			(1)	(1)	788,114	736,029	485,289	362,265	907,378	156,828	3,214,487	2,234,586
Louisiana			(1)	(1)	530,947	456,215	964,272	702,274	554,340	265,441	2,689,840	1,784,315
Maine					139,957	125,043	11,478	13,398	256,410	42,774	491,260	220,931
Maryland	(1)	(1)	(1)	(1)	306,136	226,601	1,134,290	1,488,425	885	292	3,467,211	3,115,454
Massachusetts	(1)	(1)	16,607	10,419	760,139	1,110,866	538,661	566,893	32,222	3,476	2,969,172	3,276,787
Michigan			(1)	(1)	2,829,874	1,900,090	3,976,041	1,934,987	1,314,087	539,801	14,398,338	7,265,161
Minnesota	(1)	(1)	(1)	(1)	663,261	656,949	430,413	419,708	820,883	270,026	3,271,884	1,913,708
Mississippi			640	306	256,081	157,444	960,736	423,739	494,054	174,845	1,952,783	871,638
Missouri			79.693	56,069	845,347	601,187	786,571	511,273	343,153	140,773	4,611,952	2,980,242
Montana			73,313	26,424	35,823	17,145	29,867	32,679	763,122	220,729	935,443	313,268
Nebraska			(1)	(1)	455,365	274,108	773,219	463,495	110,776	53,451	2,134,452	1,124,764
Nevada			(1)	(1)			227,340	113,671	236,213	61,080	515,267	205,583
New Hampshire					10,225	23,007	468,282	482,602	20,651	15,482	708,098	731,639
New Jersey	32,627	88,160	45,582	63,381	346,074	328,803	519,749	435,294	96,101	103,068	4,455,412	3,576,320
New Mexico	91	98	230	36	4,269	4,701	35,847	26,288	38,757	19,515	128,577	86,805
New York	6,675	3,353	(1)	(1)	3,629,330	2,706,114	2,717.299	1,848,027	170,141	108.662	19,334,360	11,585,652
North Carolina	(1)	(1)	(1)	(1)	213,879	256,809	362,379	366,845	50,316	17,842	1,630,789	968,021
North Dakota			(1)	(1)	24,315	24,936	(1)	(1)	385,067	125,177	653,950	240,525
Ohio	(1)	(1)	27,996	16,423	1,774,593	1,136,876	1,925,979	1,170,982	2,558,335	1,036,399	11,716,926	7,840,316
Oklahoma	(1)	(1)	(1)	(1)	242,242	170,848	505,291	318,895	50,140	21,880	1,556,175	978,590
Oregon			(1)	(1)	512,959	303,012	946.982	698,806	368,041	108,732	2,568,730	1,530,794
Pennsylvania			24,236	24,348	2,737,927	2,503,653	1,698,407	1,462,606	58,695	29,377	12,873,953	11,695,218
Rhode Island					(1)	(1)	328.288	57,745			381,856	90,538
South Carolina			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	513.698	231,802
South Dakota	(1)	(1)	(1)	(1)	113.249	39,389	1,535,639	166,875	174.308	26.190	2,013,350	286,591
Tennessee			(1)	(1)	432,946	366,644	855,512	597,338	62.076	29,092	2,254,350	1,751,336
Texas			170,040	26,664	1,285,466	1,121,787	1,135,729	893,899	1,331.546	471,839	5,383,450	3,187,662

Utah					55, 814	24, 863	50, 126	22, 507	788, 573	93, 850	1, 100, 918	227, 574
Vermont					5, 740	5, 828	8, 007	7, 189	11, 000	3, 000	141, 554	25, 535
Virginia			190, 360	87, 535	322, 555	271, 568	329, 097	291, 599	58, 821	36, 995	1, 791, 198	1, 225, 693
Washington			13, 415	6, 699	900, 834	383, 177	1, 072, 158	573, 735	929, 586	234, 514	3, 910, 577	1, 704, 234
West Virginia			47, 536	45, 776	357, 632	329, 237	609, 717	588, 816	83, 086	59, 924	2, 563, 113	3, 095, 743
Wisconsin	(1)	(1)	140, 984	41, 482	1, 817, 396	775, 115	1, 965, 255	1, 059, 300	731, 706	227, 289	7, 977, 261	3, 264, 271
Wyoming					(1)	(1)	451, 002	48, 670	483, 689	83, 610	941, 292	139, 273
Undistributed [2]	29, 314	52, 459	1, 174, 146	483, 138	157, 079	200, 628	539, 937	300, 301	914, 074	212, 460		
	79, 382	169, 299	[3] 6, 997, 848	[3] 1, 992, 031	30, 535, 396	22, 701, 685	38, 319, 064	25, 445, 025	[4] 22, 132, 079	[4] 7, 516, 003	183, 100, 818	111, 338, 701
Average value		2. 13		0. 28		0. 74		0. 66		0. 34		0. 61

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[1] Included under "Undistributed."

[2] Includes items entered as "(1)."

[3] Includes 1,588,852 tons of sand, valued at $541,564, used as railroad ballast, and 4,884,398 tons of sand, valued at $962,213, used by the railroads for fills, bank widening, and stock-car bedding.

[4] Includes some gravel used by the railroads for fills and other purposes.

Sand and gravel sold or used by producers in the United States in 1927, by States and uses

State	Glass sand		Molding sand		Building sand		Paving sand		Grinding and polishing sand		Fire or furnace sand		Engine sand	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama			(1)	(1)	338, 684	$123, 781	341, 789	$187, 465						
Arizona					(1)	(1)								
Arkansas	(1)	(1)	(1)	(1)	167, 300	82, 775	141, 724	81, 859	(1)	(1)	(1)	(1)	(1)	(1)
California	6, 882	$21, 917	44, 756	$66, 348	3, 475, 946	1, 876, 361	2, 533, 751	1, 162, 668	17, 837	$30, 569	34, 201	$43, 497	280, 263	$112, 173
Colorado			(1)	(1)	181, 294	132, 983	124, 145	102, 325			(1)	(1)	21, 328	14, 541
Connecticut			1, 435	1, 637	385, 536	216, 690	86, 579	61, 211	(1)	(1)				
Delaware			7, 300	5, 650	20, 891	18, 622	23, 700	11, 850	300	900	100	75	6, 000	2, 100
District of Columbia					492, 911	418, 974	67, 215	57, 133					1, 440	1, 224
Florida					791, 046	366, 124	349, 045	170, 784					4, 398	2, 377
Georgia	3, 000	3, 000	30, 000	6, 000	228, 800	92, 275	306, 625	141, 174	17, 340	8, 670	25, 000	5, 000	15, 455	3, 013
Hawaii														
Idaho					(1)	(1)							120	93
Illinois	629, 268	356, 333	652, 955	455, 913	4, 194, 993	1, 954, 694	2, 798, 414	1, 124, 956	362, 804	692, 984	(1)	(1)	129, 814	65, 196
Indiana	(1)	(1)	309, 305	172, 816	1, 688, 479	614, 630	1, 987, 573	827, 435	(1)	(1)	(1)	(1)	150, 693	42, 789
Iowa			14, 522	11, 231	583, 339	268, 056	802, 974	292, 504	(1)	(1)	(1)	(1)	34, 171	18, 102
Kansas			(1)	(1)	894, 966	625, 639	741, 833	445, 059					132, 571	89, 128
Kentucky			22, 268	34, 627	662, 048	439, 622	285, 845	188, 781	(1)	(1)	(1)	(1)	25, 611	15, 676
Louisiana					367, 237	202, 981	158, 943	77, 863					27, 194	12, 529
Maine					(1)	(1)	12, 600	8, 643					(1)	(1)
Maryland	(1)	(1)	(1)	(1)	274, 379	165, 591	1, 360, 714	732, 748	(1)	(1)			(1)	(1)
Massachusetts	940	5, 511	41, 151	40, 306	1, 092, 292	877, 179	168, 580	135, 792	7, 308	14, 160	(1)	(1)	29, 190	32, 623
Michigan	(1)	(1)	514, 616	218, 625	1, 690, 481	630, 690	3, 295, 012	1, 234, 837	175, 428	31, 620			4, 004	1, 077
Minnesota			14, 432	12, 182	716, 173	292, 238	561, 182	273, 469	2, 610	5, 428			59, 757	19, 589
Mississippi					126, 356	67, 978	149, 417	65, 024					(1)	(1)
Missouri	99, 026	144, 259	96, 961	66, 239	852, 775	553, 902	672, 383	411, 159	(1)	(1)	(1)	(1)	26, 439	17, 606
Montana					19, 935	16, 556	68, 994	66, 907					(1)	(1)
Nebraska			(1)	(1)	664, 032	300, 652	113, 188	44, 585					39, 190	10, 506
Nevada							(1)	(1)						
New Hampshire					57, 784	23, 114	194, 010	98, 375					12, 700	2, 920
New Jersey	185, 568	278, 588	444, 667	564, 826	1, 512, 150	788, 626	1, 303, 523	704, 700	70, 961	203, 897	57, 428	84, 316	87, 529	36, 615
New Mexico			100	100	(1)	(1)	27, 000	27, 000	300	450			8, 000	8, 000
New York	(1)	(1)	608, 099	1, 028, 197	5, 982, 517	2, 942, 487	6, 099, 503	2, 758, 788	(1)	(1)	(1)	(1)	119, 036	65, 675
North Carolina					258, 086	78, 891	416, 383	125, 639					34, 637	16, 897
North Dakota					21, 691	14, 915	(1)	(1)						
Ohio	(1)	(1)	738, 782	1, 005, 321	2, 813, 682	1, 781, 198	2, 347, 942	1, 543, 486	(1)	(1)	81, 101	160, 054	61, 422	38, 482
Oklahoma	30, 107	52, 787			355, 774	217, 254	603, 491	343, 100	(1)	(1)			(1)	(1)
Oregon					434, 355	273, 067	208, 438	130, 105					(1)	(1)
Pennsylvania	423, 895	814, 013	448, 586	551, 625	4, 385, 810	3, 436, 976	2, 594, 240	2, 001, 530	617, 591	730, 431	42, 910	53, 834	360, 935	429, 858
Rhode Island			(1)	(1)	(1)	(1)	3, 720	4, 600						
South Carolina					62, 974	30, 411	438, 387	145, 548					28, 150	6, 982
South Dakota					72, 488	43, 213	73, 683	11, 785					4, 775	2, 032

Tennessee	-----	-----	4,041	2,962	546,543	389,487	480,116	355,597	(1)	(1)	866	773	8,629	8,605
Texas	8,706	6,073	461	654	914,307	435,851	1,039,317	403,922	343	520	-----	-----	103,381	42,767
Utah	-----	-----	(1)	(1)	35,650	12,800	49,516	28,496	(1)	(1)	-----	-----	24,300	14,580
Vermont	-----	-----	1,413	350	9,585	6,514	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Virginia	34,878	91,947	17,151	29,159	289,837	225,030	300,102	212,595	13,203	18,289	(1)	(1)	149,487	72,428
Washington	-----	-----	(1)	(1)	551,113	249,983	269,320	118,832	-----	-----	-----	-----	110,581	32,418
West Virginia	509,905	1,100,413	(1)	(1)	206,175	228,729	497,777	433,016	(1)	(1)	11,496	9,730	272,930	245,892
Wisconsin	-----	-----	97,934	71,346	2,211,041	604,731	1,467,949	385,285	(1)	(1)	(1)	(1)	70,656	20,644
Wyoming	-----	-----	-----	-----	32,652	28,715	100	25	-----	-----	-----	-----	-----	-----
Undistributed [2]	239,518	382,949	84,040	112,394	73,270	47,782	39,880	28,836	400,737	455,772	157,699	95,556	174,104	135,599
	2,171,693	3,257,790	4,194,975	4,458,508	40,737,377	22,198,767	35,606,622	17,767,491	1,686,762	2,193,690	410,801	452,835	2,618,890	1,640,736
Average value	-----	1.50	-----	1.06	-----	0.54	-----	0.50	-----	1.30	-----	1.10	-----	0.63

[1] Included under "Undistributed."

[2] Includes items entered as "(1)."

Sand and gravel sold or used by producers in the United States in 1927, by States and uses—Continued

State	Filter sand		Other sands		Building gravel		Paving gravel		Railroad ballast gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	-----	-----	-----	-----	190,873	$115,236	612,996	$612,524	(1)	(1)	2,085,696	$1,292,233
Arizona	-----	-----	-----	-----	(1)	(1)	-----	-----	91,771	$44,990	92,956	46,363
Arkansas	-----	-----	(1)	(1)	50,512	44,676	281,493	161,575	721,108	351,646	1,461,693	832,520
California	1,467	$4,784	925,391	$279,934	2,759,637	1,978,212	2,460,072	1,771,086	1,719,925	697,708	14,260,128	8,045,257
Colorado	-----	-----	-----	-----	173,105	124,347	103,357	81,172	(1)	(1)	622,204	465,818
Connecticut	-----	-----	(1)	(1)	129,504	130,578	62,389	64,979	-----	-----	667,983	485,169
Delaware	1,625	1,250	-----	-----	1,261	1,891	-----	-----	-----	-----	61,177	42,338
District of Columbia	-----	-----	-----	-----	364,957	485,393	64,404	85,657	-----	-----	990,927	1,048,381
Florida	-----	-----	-----	-----	352,865	317,635	60,028	68,845	31,525	4,739	1,588,907	930,504
Georgia	(1)	(1)	(1)	(1)	11,860	12,977	32,461	19,881	(1)	(1)	683,366	295,505
Hawaii	-----	-----	-----	-----	-----	-----	8,505	25,515	-----	-----	8,505	25,515
Idaho	-----	-----	-----	-----	(1)	(1)	69,197	47,313	(1)	(1)	198,091	81,238
Illinois	(1)	(1)	2,503,326	1,067,147	2,598,191	1,237,709	3,324,405	1,535,623	2,108,917	652,499	19,328,703	9,166,934
Indiana	-----	-----	428,861	118,554	1,191,698	595,749	3,108,915	2,001,923	2,907,592	1,144,297	11,870,658	5,552,804
Iowa	13,378	17,714	33,205	12,186	362,512	338,950	1,793,420	725,986	328,829	129,790	3,981,143	1,839,176
Kansas	(1)	(1)	14,002	4,689	157,332	100,274	242,166	170,314	(1)	(1)	2,254,648	1,456,130
Kentucky	-----	-----	(1)	(1)	776,206	472,627	658,030	402,604	519,025	130,474	3,002,311	1,718,055
Louisiana	-----	-----	-----	-----	568,541	459,439	1,012,890	801,607	588,307	355,645	2,723,112	1,910,064
Maine	-----	-----	(1)	(1)	86,780	116,387	24,328	17,524	(1)	(1)	584,395	251,448
Maryland	-----	-----	1,698	1,486	185,479	166,164	(1)	(1)	1,094	361	2,914,448	2,185,248
Massachusetts	3,051	8,164	(1)	(1)	586,373	754,237	707,215	616,561	1,301	1,479	2,646,335	2,495,696
Michigan	-----	-----	(1)	(1)	2,755,945	1,836,424	4,971,393	3,083,211	1,132,101	425,959	15,419,499	7,800,541
Minnesota	1,035	3,105	41,973	16,992	623,034	631,046	628,473	629,544	866,885	288,032	3,515,554	2,171,625
Mississippi	-----	-----	(1)	(1)	151,806	96,473	1,344,092	658,203	1,266,025	460,549	3,122,401	1,372,089
Missouri	-----	-----	(1)	(1)	1,207,632	754,441	845,819	550,980	815,793	207,349	4,829,473	2,875,530
Montana	-----	-----	(1)	(1)	33,843	22,356	421,915	468,466	1,504,334	310,669	2,187,934	910,513
Nebraska	-----	-----	(1)	(1)	629,561	431,805	872,453	551,687	41,254	16,459	2,420,364	1,370,605
Nevada	-----	-----	(1)	(1)	-----	-----	(1)	(1)	378,836	126,265	462,574	187,150
New Hampshire	-----	-----	-----	-----	-----	-----	543,124	486,805	56,000	42,000	863,618	653,214
New Jersey	29,208	82,048	29,109	39,756	270,421	267,212	587,509	487,111	49,086	64,594	4,627,159	3,602,289
New Mexico	80	120	-----	-----	(1)	(1)	31,036	31,036	(1)	(1)	360,020	226,990
New York	12,145	3,816	29,392	21,609	3,914,189	3,172,939	2,699,462	1,951,884	410,652	191,022	19,896,766	12,157,612
North Carolina	-----	-----	6,553	3,275	247,558	203,770	456,404	421,698	43,187	21,246	1,462,808	871,416
North Dakota	-----	-----	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	343,820	134,830
Ohio	(1)	(1)	107,509	32,386	2,071,035	1,549,503	2,252,534	1,622,426	2,604,724	1,062,333	13,187,415	9,085,413
Oklahoma	-----	-----	(1)	(1)	87,049	60,317	844,030	616,064	131,654	27,016	2,074,963	1,331,222
Oregon	-----	-----	(1)	(1)	593,689	330,718	973,647	630,692	(1)	(1)	2,415,069	1,438,798
Pennsylvania	-----	-----	14,215	16,733	2,939,220	2,482,095	1,929,954	1,512,380	74,825	10,931	13,832,181	12,040,406
Rhode Island	-----	-----	-----	-----	(1)	(1)	253,509	273,713	-----	-----	271,065	303,639
South Carolina	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)	(1)	(1)	893,772	397,781
South Dakota	-----	-----	8,480	1,532	62,783	52,141	614,633	56,558	325,981	63,957	1,162,823	231,218
Tennessee	-----	-----	(1)	(1)	258,707	217,862	1,005,029	758,197	(1)	(1)	2,479,249	1,842,144

Texas			213, 859	67, 277	1, 255, 709	1, 024, 294	2, 403, 645	1, 531, 704	3, 755, 424	1, 181, 072	9, 695, 152	4, 694, 134
Utah					4, 804	2, 756	(1)	(1)	570, 779	89, 625	903, 244	272, 609
Vermont			(1)	(1)	(1)	(1)	7, 950	7, 725	28, 775	10, 125	171, 250	39, 143
Virginia			(1)	(1)	200, 754	190, 886	354, 591	298, 776	(1)	(1)	1, 502, 248	1, 217, 450
Washington			(1)	(1)	787, 227	320, 943	965, 773	478, 399	1, 701, 605	359, 192	4, 423, 246	1, 570, 999
West Virginia					132, 235	126, 215	813, 171	655, 178	59, 805	30, 677	2, 522, 617	2, 879, 631
Wisconsin	(1)	(1)	325, 239	54, 308	1, 550, 462	622, 584	2, 628, 663	1, 271, 105	629, 348	100, 927	9, 020, 124	3, 190, 334
Wyoming					22, 406	23, 121	430, 400	344, 320	874, 917	97, 884	1, 360, 475	494, 065
Undistributed [2]	12, 685	34, 136	1, 403, 733	428, 580	84, 276	75, 284	1, 386, 495	1, 293, 814	2, 200, 540	701, 846		
	74, 674	155, 137	[3] 6, 036, 545	[3] 2, 166, 444	30, 432, 031	21, 947, 666	44, 891, 975	29, 887, 365	[4] 28, 541, 924	[4] 9, 403, 357	197, 454, 269	115, 529, 786
Average value		2. 08		0. 36		0. 72		0. 67		0. 33		0. 59

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[1] Included under "Undistributed."

[2] Includes items entered as "(1)."

[3] Includes 2,979, 836 tons of sand, valued at $832,190, used for railroad ballast, and 1,026,748 tons of sand, valued at $182,767, used by the railroads for fills, bank widening, and stock-car bedding.

[4] Includes some gravel used by the railroads for fills and other purposes.

Sand and gravel sold or used by producers in the United States, 1918–1927

Year	Sand		Gravel (including railroad ballast)		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	33, 119, 820	$24, 363, 769	28, 704, 606	$13, 563, 310	61, 824, 426	$37, 927, 079
1919	35, 969, 736	26, 389, 679	34, 606, 671	19, 561, 877	70, 576, 407	45, 951, 556
1920	43, 776, 142	39, 198, 614	38, 265, 246	26, 462, 991	82, 041, 388	65, 661, 605
1921	38, 294, 954	29, 049, 950	41, 550, 054	27, 434, 295	79, 845, 008	56, 484, 245
1922	49, 694, 923	35, 469, 920	45, 172, 123	29, 147, 744	94, 867, 046	64, 617, 664
1923	67, 365, 271	48, 473, 565	72, 566, 882	42, 430, 089	139, 932, 153	90, 903, 654
1924	75, 572, 010	48, 844, 465	80, 658, 053	48, 168, 650	156, 230, 063	97, 013, 115
1925	87, 182, 222	55, 148, 325	84, 819, 251	52, 393, 798	172, 001, 473	107, 542, 123
1926	92, 114, 279	55, 675, 988	90, 986, 539	55, 662, 713	183, 100, 818	111, 338, 701
1927	93, 588, 339	54, 291, 398	103, 865, 930	61, 238, 388	197, 454, 269	115, 529, 786

Sand and gravel sold or used by producers in the United States, 1926–27, by uses

Use	1926		1927	
	Short tons	Value	Short tons	Value
Sand:				
Glass	2, 274, 218	$3, 615, 371	2, 171, 693	$3, 257, 790
Molding	5, 309, 166	5, 630, 799	4, 194, 975	4, 458, 508
Building	45, 327, 512	24, 891, 475	40, 737, 377	22, 198, 767
Paving	27, 476, 998	14, 970, 906	35, 606, 622	17, 767, 491
Grinding and polishing	1, 859, 215	2, 504, 514	1, 686, 762	2, 193, 690
Fire or furnace	434, 541	460, 967	410, 801	452, 835
Engine	2, 355, 399	1, 440, 626	2, 618, 890	1, 640, 736
Filter	79, 382	169, 299	74, 674	155, 137
Other	6, 997, 848	1, 992, 031	6, 086, 545	2, 166, 444
	92, 114, 279	55, 675, 988	93, 588, 339	54, 291, 398
Gravel:				
Building	30, 535, 396	22, 701, 685	30, 432, 031	21, 947, 666
Paving	38, 319, 064	25, 445, 025	44, 891, 975	29, 887, 365
Railroad ballast	22, 132, 079	7, 516, 003	28, 541, 924	9, 403, 357
	90, 986, 539	55, 662, 713	103, 865, 930	61, 238, 388
Grand total	183, 100, 818	111, 338, 701	197, 454, 269	115, 529, 786

VALUES

The general trend in average value for the different classes of sand and gravel in 1927 was slightly downward, except for molding, fire or furnace, and engine sand and paving and road-making gravel.

The average value per ton for the total output of sand and gravel in 1927 was 59 cents, a decrease from 61 cents in 1926. The washed and screened sand and gravel, considered alone, averaged 62 cents a ton in 1927, as compared with 64 cents in 1926.

Average value per short ton of sand and gravel sold or used by producers in the United States, 1918–1927

[Based on amounts received for sales f. o. b. pits or nearest shipping points]

Kind	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Glass sand	$1.94	$1.97	$2.19	$1.81	$1.62	$1.84	$1.71	$1.64	$1.59	$1.50
Molding sand	1.04	1.10	1.46	1.29	1.17	1.21	1.13	1.08	1.06	1.06
Building sand	.50	.56	.68	.65	.60	.61	.57	.58	.55	.54
Paving sand	.54	.66	.68	.63	.61	.59	.56	.55	.54	.50
Grinding and polishing sand	1.60	1.34	1.80	1.61	1.46	1.62	1.54	1.38	1.35	1.30
Fire or furnace sand	1.48	1.23	1.81	1.56	1.42	1.45	1.23	1.14	1.06	1.10
Engine sand	.76	.77	.82	.86	.76	.76	.66	.62	.61	.63
Filter sand	1.47	1.48	1.27	1.11	1.99	1.20	2.01	2.34	2.13	2.08
Railroad ballast gravel	.22	.30	.32	.33	.36	.29	.31	.33	.34	.33
Gravel (exclusive of railroad ballast)	.57	.66	.81	.75	.72	.72	.70	.70	.70	.69
All sand and gravel	.61	.65	.80	.71	.68	.65	.62	.63	.61	.59

SIZE OF SAND AND GRAVEL PRODUCING COMPANIES

Of the 197,454,000 tons of sand and gravel sold or used by producers in 1927, 174,212,000 tons is recorded as produced or sold by 1,663 "companies" (corporations, partnerships, and individuals) which may be designated "commercial companies," and the remainder is very largely, if not entirely, noncommercial production, chiefly by State and county highway commissions, cities, and other Government organizations, and by railroads for use in their own work.

In the following table the number and output of commercial producers have been classified to show the proportions in several groups having the designated size of output. This classification is based upon the total company outputs, not individual plant output. (A large number of companies report to the Bureau of Mines operations of two or more plants, and some of these operate a considerable number of plants at widely separated localities. Only the total for each company has been considered in the classification.)

Classification of commercial sand and gravel production in 1927, by size groups

Size group	Companies			Production		
	Number	Per cent of total	Cumulative per cent	Short tons	Per cent of total	Cumulative per cent
Less than 25,000 short tons	834	50.15	50.15	6,321,000	3.63	3.63
25,000 and less than 50,000	223	13.41	63.56	8,055,000	4.62	8.25
50,000 and less than 100,000	236	14.19	77.75	16,607,000	9.53	17.78
100,000 and less than 200,000	183	11.01	88.76	25,164,000	14.45	32.23
200,000 and less than 300,000	72	4.33	93.09	17,410,000	9.99	42.22
300,000 and less than 400,000	38	2.29	95.38	13,172,000	7.56	49.78
400,000 and less than 500,000	18	1.08	96.46	7,930,000	4.55	54.33
500,000 and less than 600,000	7	.42	96.88	3,676,000	2.11	56.44
600,000 and less than 700,000	10	.60	97.48	6,619,000	3.80	60.24
700,000 and less than 800,000	6	.36	97.84	4,457,000	2.56	62.80
800,000 and less than 900,000	7	.42	98.26	5,948,000	3.42	66.22
900,000 and less than 1,000,000	3	.18	98.44	2,954,000	1.70	67.92
1,000,000 and less than 2,000,000	16	.96	99.40	23,402,000	13.43	81.35
2,000,000 short tons and over	10	.60	100.00	32,497,000	18.65	100.00
	1,663	100.00	100.00	174,212,000	100.00	100.00

It will be noted from the table that 834 of the 1,663 companies considered produced less than 25,000 tons each. On a 250-day year this means production of roughly two cars, or 100 tons, daily, indicating the relatively small size of a large majority of the individual companies. It further indicates the position of the industry as a highly decentralized one. On the other hand, these 834 companies accounted for less than 4 per cent of the total production of commercial sand and gravel, further illustrating the diversification of the industry.

Further interpretation of the table shows that 50 per cent of the total commercial production came from 1,586 companies, or 95 per cent of the total number classified. In other words, less than 5 per cent of the companies produced 50 per cent of the country's commercial production of sand and gravel. The table shows further that less than 2 per cent of the companies can be classed as very large operators (1,000,000 tons or more) although these large companies account for 32 per cent of the total commercial production.

The large percentage of small companies engaged in the industry indicates a healthy competitive condition, while the relatively large production in the hands of a few large companies with widely separated units tends toward stability in quantity and quality of production and price levels.

GLASS SAND

The production of glass sand in 1927 amounted to 2,171,693 tons, valued at $3,257,790, a decrease of 4.5 per cent in quantity and 10 per cent in value, as compared with 1926. Glass sand was produced in 1927 in 17 States, of which the largest producers, in order of quantity, were Illinois, West Virginia, Pennsylvania, New Jersey, and Missouri; the output in these five States ranged from 629,268 tons in Illinois to 99,026 tons in Missouri. West Virginia was first in total value and Pennsylvania, Illinois, New Jersey, and Missouri followed in order.

The average value per ton for the total output of glass sand was $1.50 in 1927, as compared with $1.59 in 1926 and $1.64 in 1925.

Glass sand sold or used by producers in the United States, 1918–1927

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1918	2,172,887	$4,209,728	$1.94	1923	2,034,958	$3,751,778	$1.84
1919	1,827,409	3,593,371	1.97	1924	2,169,899	3,718,973	1.71
1920	2,165,926	4,748,690	2.19	1925	2,334,921	3,836,085	1.64
1921	1,280,359	2,314,314	1.81	1926	2,274,218	3,615,371	1.59
1922	1,768,549	2,866,366	1.62	1927	2,171,693	3,257,790	1.50

MOLDING SAND

The production of molding sand decreased 21 per cent in both quantity and value in 1927 as compared with 1926. Reports from producers indicate that demand was very poor in 1927 in some of the States which led in production in 1926. Molding sand was reported from 32 States in both 1927 and 1926. The States leading in quantity in 1927 were Ohio, Illinois, New York, Michigan, Pennsylvania, New Jersey, and Indiana, the output ranging from 738,782 tons in Ohio to 309,305 tons in Indiana. New York again led in total value with Ohio a close second and with New Jersey, Pennsylvania, Illinois, Michigan, and Indiana following in order; the value ranged from $1,028,197 in New York to $172,816 in Indiana.

The average value per ton for the total production of molding sand in 1927 was virtually the same as in 1926, or $1.06.

Molding sand sold or used by producers in the United States, 1918–1927

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1918	4, 910, 178	$5, 121, 865	$1. 04	1923	5, 559, 644	$6, 730, 417	$1. 21
1919	3, 774, 612	4, 153, 990	1. 10	1924	4, 403, 893	4, 995, 268	1. 13
1920	5, 128, 075	7, 504, 759	1. 46	1925	4, 995, 428	5, 400, 618	1. 08
1921	1, 906, 977	2, 451, 966	1. 29	1926	5, 309, 166	5, 630, 799	1. 06
1922	3, 839, 116	4, 478, 405	1. 17	1927	4, 194, 975	4, 458, 508	1. 06

IMPORTS

Imports of sand and gravel in 1927 amounted to 736,271 short tons, valued at $302,551, a decrease of 22 per cent in quantity and 12 per cent in value from 1926, but comparing favorably with those of other recent years. There were increased importations of glass sand and of gravel in 1927. Glass sand imports in 1927 amounted to 10,665 tons, or 1.4 per cent of the total, and averaged 82 cents a ton. Gravel imports amounted to 313,809 tons, or 43 per cent of the total, and averaged 33 cents a ton.

Canada was the source of 85 per cent of the total quantity of sand and gravel imported in 1927, and Belgium, Mexico, and the United Kingdom followed in order. Other countries furnishing smaller quantities (some of high average value) are also shown in the table on page 166. Much of the sand and gravel imported comes into the country as ballast.

The values given for imports are those upon which the import tax in this country is levied and represent the foreign market value (or the export value, if higher) plus the cost of containers and all expenses incident to placing merchandise ready for shipment to the United States, including the export tax, if any.

Sand and gravel imported for consumption in the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	([1])	$91, 465	1923	477, 762	$259, 820
1919	597, 481	126, 586	1924	701, 410	280, 206
1920	1, 226, 684	912, 282	1925	534, 555	233, 422
1921	906, 905	771, 734	1926	947, 579	341, 911
1922	451, 943	238, 386	1927	736, 271	302, 551

[1] Quantities not recorded prior to July, 1918. During last 6 months of 1918 the imports were 284,036 tons, valued at $46,910

Sand and gravel imported for consumption in the United States, 1925–1927, by classes

Class	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Glass sand	4, 186	$2, 262	8, 817	$9, 091	10, 665	$8, 712
Other sand	305, 769	141, 655	699, 286	242, 594	411, 797	189, 527
Gravel	224, 600	89, 505	239, 476	90, 226	313, 809	104, 312
	534, 555	233, 422	947, 579	341, 911	736, 271	302, 551

Sand and gravel imported into the United States, 1925–1927, by countries

[General imports]

Country	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
North America:						
Bermuda					1	$4
Canada	463, 930	$174, 726	846, 758	$272, 729	622, 872	211, 522
Cuba	193	204	728	986		
Mexico	571	390	11, 284	2, 450	32, 059	7, 780
South America: Brazil	441	7, 092				
Europe:						
Belgium	68, 290	38, 902	85, 164	49, 814	76, 293	47, 684
Czechoslovakia					24	153
Denmark	84	1, 046				
France	696	5, 427	1, 096	7, 553	788	7, 348
Germany	6	116	4	61	352	110
Italy	11	20				
Netherlands	136	1, 070	299	3, 537	748	8, 191
Spain			6	220		
Sweden			273	244		
United Kingdom	28	1, 269	1, 959	4, 114	2, 325	5, 819
Asia:						
India (British)	169	3, 135	6	152	805	13, 915
Japan	(1)	25	2	51	3	22
Oceania: Australia					1	3
	534. 555	233, 422	947, 579	341, 911	736, 271	302, 551

[1] Less than 1 ton.

EXPORTS

Exports of sand and gravel in 1927 amounted to 421,243 short tons, valued at $557,644, a decrease of less than 1 per cent in quantity but of nearly 9 per cent in value from 1926. The average value of the material exported was $1.32 a ton in 1927, compared with $1.44 in 1926.

Sand and gravel exported from the United States, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	(1)	$619, 414	1923	551, 233	$598, 633
1919	(1)	382, 070	1924	314, 140	401, 662
1920	(1)	669, 945	1925	425, 612	496, 050
1921	(1)	379, 982	1926	424, 374	610, 023
1922	356, 520	400, 199	1927	421, 243	557, 644

[1] Quantity not recorded prior to 1922.

MAGNESIUM AND ITS COMPOUNDS

By J. M. Hill[1]

INTRODUCTION

For many years magnesite, the normal carbonate of magnesium, and dolomite, or high-magnesium limestone, were the only commercial sources of magnesian products in the United States. Other natural compounds are magnesium chloride and magnesium sulphate. In 1927 a deposit of brucite (magnesium hydrate) of commercial size was discovered in northwestern Nye County, Nev., 30 miles north of Luning. The manufactured compounds include the basic (or "technical") carbonate, calcined and dead-burned magnesite, dead-burned dolomite, and precipitated carbonate and sulphate derived from magnesite or dolomite, or from the crude sulphate.

This report considers only the dolomite that is used because of its magnesium content.

The uses to which magnesite has been or may be put, for most of which dolomite is also used, are as follows:[2]

For refractory brick, shapes, crucibles, and furnace hearths, for which both dead-burned magnesite and dead-burned dolomite are used; for medicinal and toilet preparations, which are made from magnesite, dolomite, and natural magnesium sulphate; for pipe covering (mixed with asbestos), which in this country is made from dolomite; for oxychloride (Sorel) cement, which is made from a mixture of caustic calcined magnesite and magnesium chloride; as an absorbent in the manufacture of dynamite, an accelerator in the vulcanization of rubber, fused magnesia for insulation at exceedingly high temperatures, and an adulterant of paint—all of which presumably call for calcined magnesite but are relatively unimportant in the consumption of domestic magnesite; in the manufacture of carbon dioxide and the sulphite process of paper manufacturing, in both of which magnesite has been largely displaced by cheaper dolomite or limestone; and for metallic magnesium, which is made from calcined magnesite and from magnesium chloride.

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[1] Helen M. Gaylord, of the Bureau of Mines, assisted in the preparation of this report. Figures on imports and exports were compiled from records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, of the Bureau of Mines.

[2] These uses are reviewed in detail in U. S. Geol. Survey Bull. 355, 1908. Brief comments on magnesium chloride, sulphate, basic carbonate, metallic magnesium, and their uses appear in the chapter on magnesite in Mineral Resources, 1914, pt. 2, pp. 573-577.

MAGNESITE

DOMESTIC PRODUCTION

In 1927 mines in the United States produced 121,490 short tons of crude magnesite, valued at $1,090,550, a decrease of 9 per cent in both quantity and value, as compared with 1926. The value for the total crude magnesite is determined by arbitrary valuations f. o. b. shipping points; these valuations averaged $11.60 a ton in California in 1927, as compared with $11.20 in 1926, and $7.50 a ton in Washington in both 1927 and 1926. Of the total output in 1927, 43,750 tons was produced in California, a decrease of over 10,000 tons compared with 1926, and 77,740 tons in Washington, a decrease of nearly 2,000 tons. Most of the production in California was sold as caustic calcined magnesite, and most of that in Washington was sold as dead-burned.

Three producers in California in 1927 operated in three counties. In Washington one company produced crude magnesite from deposits near Chewelah, in Stevens County.

Producers reported 6,150 tons of crude magnesite in stock on dumps at the end of 1927, as compared with 4,340 tons in 1926. These stocks do not include large quantities of fines held at several dumps for eventual calcination.

Domestic magnesite (expressed as equivalent crude) sold or treated in the United States, 1918–1927

Year	California		Washington		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	84,077	$761,811	147,528	$1,050,790	231,605	$1,812,601
1919	50,020	504,973	106,206	743,442	156,226	1,248,415
1920	81,782	1,083,262	221,985	1,664,888	303,767	2,748,150
1921	47,904	510,177			47,904	510,177
1922	[1] 55,790	[1] 571,745	(1)	(1)	55,790	571,745
1923	73,350	938,600	73,900	165,100	147,250	1,103,700
1924	67,240	901,700	52,860	139,600	120,100	1,041,300
1925	64,600	872,100	56,060	560,600	120,660	1,432,700
1926	53,940	604,130	79,560	596,700	133,500	1,200,830
1927	43,750	507,500	77,740	583,050	121,490	1,090,550

[1] Washington included with California. Bureau of Mines not at liberty to publish figures.

Magnesite of domestic origin sold, 1922–1927

Year	Crude			Caustic calcined			Dead-burned		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average		Total	Average		Total	Average
1922	1,300	$13,330	$10.25	21,990	$813,630	$37.00	2,200	$51,260	$23.30
1923	6,020	78,260	13.00	28,470	1,035,740	36.38	34,410	671,000	19.50
1924	1,570	20,410	13.00	26,520	883,120	33.30	29,830	787,500	26.40
1925	2,090	26,290	12.58	23,900	782,700	32.75	29,110	923,960	31.74
1926	1,540	17,440	11.32	18,580	596,370	32.10	42,540	1,089,680	25.62
1927	1,800	17,130	9.52	13,890	452,810	32.60	40,210	990,300	24.63

CRUDE MAGNESITE

In 1927 the quantity of domestic magnesite sold crude by the producers was 1,800 short tons, most of which was later calcined at small plants for use as plaster; the average value was $9.52 a ton. A small quantity of crude magnesite was used by makers of high-grade refractory products, and a much smaller quantity of carefully selected magnesite was sold for the manufacture of metallic magnesium.

CAUSTIC CALCINED MAGNESITE

The domestic caustic calcined magnesite sold in 1927 amounted to 13,890 short tons, a decrease of 25 per cent as compared with 1926; the average value was $32.60 a ton; all came from mines in California. The producers of caustic calcined magnesite were C. S. Maltby, the Sierra Magnesite Co., and the Red Mountain Magnesite Co.

The use of caustic calcined magnesite for stucco apparently declined, although the use for flooring continued good. Bureau of Standards Circular 323, issued April 13, 1927, gives master specification for plastic magnesia cement (magnesia-oxychloride) used as flooring, bases, wainscots, etc. Newer uses assuming importance are for floor sleepers and tack strips, replacing wood laid in buildings of concrete construction.

DEAD-BURNED MAGNESITE

The domestic dead-burned magnesite sold in the United States in 1927 amounted to 40,210 short tons, a decrease of 5 per cent as compared with 1926; the average value was $24.63 a ton, or 99 cents a ton less than in 1926. Eighty-seven per cent of the dead-burned output in 1927 was produced in Washington, but some was produced in Santa Clara and Tulare Counties, Calif.

Recently the development of sintered magnesite has become of more importance, and artificial periclase (MgO) for use as a high-grade refractory is now being produced.

MARKET AND PRICES

In 1927 the market for domestic magnesite of all grades was poor, and several former producers abandoned their operations.

Operators reported only small sales of domestic crude magnesite at $7.50 to $13 a ton; the average price of the crude magnesite sold in 1927 was $9.52 a ton. Crude magnesite was imported in the eastern markets in 1927 at an average declared value of $10.02 a short ton.

Domestic grade A caustic calcined magnesite was quoted[3] at $40 a ton ground, f. o. b. plants in California, and grade B was quoted at $38 a ton throughout the year. Producers reported sales of domestic caustic calcined magnesite at prices ranging from $30 to $34 a ton, and the average selling price was $32.60 a ton f. o. b. shipping point. The average declared value of imported caustic magnesite was $23.49 a ton.

Domestic dead-burned magnesite was quoted[4] at $33 a ton delivered eastern seaboard until the 1st of November, when the price dropped to $30 to $32 a ton, at which figure it remained to the end of the year.

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[3] Engineering and Mining Journal: Vols. 123 and 124, 1927.

[4] See footnote 3.

Producers reported the bulk of sales at $29 a ton f. o. b. California plants and $24 a ton f. o. b. Washington plants; the average for the total output was $24.63 a ton f. o. b. plant.

By proclamation of the President of the United States, effective December 10, 1927, the rates of import duty on magnesite were increased from five-sixteenths of a cent to fifteen thirty-seconds of a cent a pound ($6.25 to $9.375 a short ton) for crude and from five-eighths of a cent to fifteen-sixteenths of a cent a pound ($12.50 to $18.75 a short ton) for caustic calcined.

Average value per short ton of domestic and imported magnesite, 1923–1927

Year	Domestic [1]			Imported [2]		
					Calcined, not purified	
	Crude	Caustic calcined	Dead-burned	Crude	Caustic calcined	Dead-burned
1923	$13.00	$36.38	$19.50	$8.51	$28.10	$11.46
1924	13.00	33.30	26.40	14.17	23.44	16.32
1925	12.58	32.75	31.74	13.10	24.29	14.54
1926	11.32	32.10	25.62	10.78	22.26	14.64
1927	9.52	32.60	24.63	10.02	23.49	14.59

[1] Value f. o. b. mine shipping point.

[2] Declared value.

The companies in California and Washington named below produced magnesite in 1927. Most of the producers sell the calcined products, although some crude can possibly be purchased from any of them.

California: C. S. Maltby, Humboldt Bank Building, San Francisco; Sierra Magnesite Co., 233 Sansome Street, San Francisco; Red Mountain Magnesite Co., First National Bank Building, San Francisco.

Washington: Northwest Magnesite Co., Crocker Building, San Francisco, Calif.

IMPORTS

Magnesite, not purified, imported into the United States, 1923–1927, by countries, in short tons

[General imports]

Country	1923	1924	1925	1926	1927
Africa, British South		(1)	34		
Austria	1,675	156		7,028	39,752
Belgium	101	54	433	303	187
Canada	427	124	95	41	213
Czechoslovakia			100	1,688	9,666
Denmark				360	
France		28			
Germany	162	206	275	169	74
Greece	5,510	110	408	594	840
India, British	7,576	8,011	9,933	9,223	5,795
Italy	65,262	54,619	51,521	68,269	317
Kwantung				25	
Netherlands	4,406	5,348	4,752	3,944	3,167
Norway			23		
Poland and Danzig	1				(2)
Rumania	24				
United Kingdom:					
England	162	548	1,543	902	213
Scotland	729	1,202			
	86,035	70,406	69,117	92,546	60,224

[1] 595 pounds.

[2] 1,100 pounds.

Magnesite, not purified, imported into the United States, 1926–27

[General imports]

Country	Crude		Caustic calcined		Dead-burned and grain (not suitable for manufacture into oxychloride cements)	
	Pounds	Value	Pounds	Value	Pounds	Value
1926						
Austria			374, 118	$3, 725	13, 682, 485	$107, 932
Belgium			556, 894	8, 967	48, 468	891
Canada			81, 500	1, 513		
Czechoslovakia			95, 658	1, 654	3, 280, 800	28, 778
Denmark					720, 000	6, 326
Germany	754	$38	338, 388	5, 397		
Greece	1, 187, 200	6, 360				
India, British			18, 446, 071	154, 453		
Italy			55, 434	916	136, 483, 400	984, 890
Kwantung	21, 860	136	27, 727	371		
Netherlands	6, 394	21	7, 881, 379	119, 880	320	6
United Kingdom			1, 803, 510	33, 255		
	1, 216, 208	6, 555	29, 660, 679	330, 131	154, 215, 473	1, 128, 823
1927						
Austria			63, 115	867	79, 440, 280	575, 633
Belgium			373, 534	6, 092		
Canada	266	3	184, 500	2, 667	240, 800	2, 914
Czechoslovakia					19, 331, 727	144, 094
Germany			44, 754	1, 822	103, 422	1, 189
Greece	1, 568, 000	7, 113	111, 536	1, 220		
India, British	140, 068	1, 369	11, 449, 402	102, 316		
Italy			4, 480	45	629, 003	4, 051
Netherlands	4, 586	89	6, 330, 581	99, 600		
Poland and Danzig			1, 100	24		
United Kingdom			427, 051	8, 375		
	1, 712, 920	8, 574	18, 990, 053	223, 028	99, 745, 232	727, 881

Magnesite imported for consumption in the United States, 1918–1927

Year	Crude		Calcined, not purified	
	Short tons	Value	Short tons	Value
1918	5, 432	$103, 233	19, 049	$824, 022
1919	6, 381	103, 311	9, 471	270, 721
1920	33, 550	406, 204	14, 780	373, 165
1921	51, 993	525, 452	6, 788	250, 932
1922	73, 331	976, 283	72, 265	1, 267, 622
1923	5, 182	44, 081	72, 955	1, 022, 968
1924	6	85	64, 785	1, 172, 403
1925	487	6, 382	68, 395	1, 160, 830
1926	608	6, 555	90, 293	1, 438, 765
1927	856	8, 574	59, 261	946, 361

EXPORTS

Exports of magnesite are not separately recorded. Materials made of magnesia (including pipe and boiler coverings) having a weight of 5,532,493 pounds and valued at $308,539 were exported in 1927, as compared with 6,579,221 pounds, valued at $323,386, in 1926.

IMPORTED STOCKS

Stocks of imported crude and caustic calcined magnesite in bonded warehouses averaged 13,116 short tons a month during 1927; the largest amount was 13,183 tons in January and the lowest 13,110 tons during March to November, inclusive. Bonded stocks of dead-burned averaged 685 tons a month; the largest stock was 1,141 tons in January and the smallest 571 tons in April.

ANNUAL SUPPLY

The annual additions to supply of magnesite may be considered as domestic production plus imports, for there are no exports of crude or calcined magnesite. Such estimates have been called "consumption," but they do not take into account stocks held at consuming plants.

Magnesite supply in the United States, 1926–27, in short tons

Class	1926			1927		
	Sales (domestic)	Imports for consumption	Total new supply	Sales (domestic)	Imports for consumption	Total new supply
Crude	1,540	608	2,148	1,800	856	2,656
Caustic calcined	18,580	14,758	33,338	13,890	9,568	23,458
Dead-burned	42,540	75,535	118,075	40,210	49,693	89,903

DOMESTIC INDUSTRY

California.—No magnesite was produced in Alameda, Fresno, Napa, Placer, San Benito, or Sonoma Counties in 1927. Late in the year, after the raise in tariff, the Ward property near Piedra was leased to George W. Elder, and the Levensaler property, also near Piedra, was reopened; neither property reached a producing basis in 1927. The Sampson Magnesite Co., owner of the Sampson Peak mine in San Benito County, began mining and dead-burning in 1927, but shipped no magnesite during the year. C. S. Maltby, operator of the Red Mountain mines in Santa Clara County, was the largest producer in the State, producing both dead-burned and caustic calcined magnesite. In Stanislaus County the Red Mountain Magnesite Co. operated the Red Mountain mine west of Patterson and produced some caustic calcined magnesite in an upright kiln; a little magnesite was mined at the Bald Eagle mine near Gustine, but none was shipped. The Sierra Magnesite Co. was the only producer in Tulare County and the second largest operator in the State; its mines are at Magnesite, 12 miles east of Porterville, and the calcining plant is at Porterville, where the two 70-ton rotary kilns were in operation throughout the year. The California Magnesia Co., which formerly worked the Porterville Hill property, was dissolved. No mining was done at the Gray Eagle mine near Chinese Camp, in Tuolumne County, but late in the year it was reported that the Orecal Metals (Inc.) was opening a deposit northwest of Chinese Camp.

Nevada.—During 1927 a deposit of brucite (magnesium hydrate) was discovered on the west slope of Paradise Mountains in Nye County, 30 miles north of Luning. The owner, H. E. Springer, of Mina, states that the brucite occurs on a contact of granite with dolomite. Two bodies are reported—the larger, 900 feet long by 65 feet wide, and the smaller, 100 feet long by 50 feet wide. Samples sent the writer appear to be pure.

Washington.—The Northwest Magnesite Co. operated the Finch mine, near Chewelah, Stevens County, throughout 1927; two of its six kilns were used part of the year, making dead-burned magnesite. Siegfus [5] has given a detailed description of the geology of the magnesite deposits in Stevens County, particularly of the Finch mine, and concludes that "the Washington magnesite was deposited directly and contemporaneously as magnesium carbonate."

The Double Eagle mine, near Valley, Stevens County, was not operated in 1927. The Spokane Plastic Magnesite Co., using crude magnesite from the Finch mine, produced a few hundred tons of caustic calcined magnesite at its plant in Spokane.

FOREIGN INDUSTRY

Austria.—Imports of dead-burned magnesite into the United States from Austria in 1927 amounted to 39,720 short tons, or 80 per cent of total imports of refractory magnesite.

Canada.—During 1927 imports of caustic calcined magnesite into the United States from Canada amounted to 93 short tons.

Greece.—Exports of crude magnesite from Greece during the first nine months of 1927 amounted to 8,378 metric tons, of which Great Britain took 5,480 tons, Italy 1,200 tons, Netherlands 1,182 tons, and France 500 tons.[6] Imports directly from Greece into the United States in 1927 amounted to 784 short tons of crude magnesite and 56 short tons of caustic calcined. Thoenen [7] has described the magnesite deposits on the island of Euboea; he does not believe that the magnesite originated from the serpentine, because of the action of descending carbonated waters, but he offers no other hypothesis.

India.—Imports of caustic calcined magnesite into the United States in 1927 from India amounted to 5,725 short tons, or over 60 per cent of the total imports of caustic calcined magnesite; 70 short tons of Indian crude magnesite was also imported. The production of magnesite in India in 1926 was 30,461 long tons.[8]

Yugoslavia.—It is reported [9] that a 50-year concession was given on a 550-hectare tract, on the Milicevacka River near Premina in the Rudnick district, which contains veins of magnesite showing by analysis little iron, silica, or alumina.

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[5] Siegfus, S. S., Some Geological Features of the Washington Deposits: Eng. and Min. Jour., vol. 124, 1927, pp. 853–857.

[6] Bureau of Foreign and Domestic Commerce, Foreign Trade Notes, No. 183, Mar. 17, 1928.

[7] Thoenen, J. R., Notes on the Genesis of Grecian Magnesite: Am. Inst. Min. and Met. Eng., Technical Publication No. 67, Class II, Nonmetallic Minerals, No. 3, February, 1928.

[8] The Mining Journal (London): Vol. 160, Feb. 4, 1928, pp. 87–88.

[9] Bureau of Foreign and Domestic Commerce. Foreign Trade Notes, No. 153, Aug. 6, 1927, p. 2.

WORLD PRODUCTION

World's production of magnesite, 1922–1926, by countries, in metric tons[1]

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1922	1923	1924	1925	1926
Australia:					
New South Wales	3,424	6,228	12,697	14,237	10,428
South Australia	585	168	131	357	230
Victoria	99	76	77	92	96
Western Australia	-----------	[2] 2	-----------	-----------	-----------
Austria [3]	281,247	180,292	156,868	164,282	162,959
Canada	7,873	12,079	9,512	3,827	(4)
Cyprus [2]	895	284	224	-----------	83
Czechoslovakia [5]	92,942	64,030	60,044	69,532	83,135
Greece	56,642	62,552	66,727	90,828	95,638
India, British	19,582	19,748	24,854	30,095	30,950
Italy	8,700	12,474	13,436	14,146	19,842
Norway	738	2,359	1,976	1,699	715
Russia	10,909	[6] 18,445	[6] 33,214	[6] 75,840	[6] 103,017
Spain	303	-----------	-----------	-----------	-----------
Union of South Africa	997	1,387	2,001	1,823	1,826
United States (sold or treated)	50,612	133,582	108,952	109,460	121,109

[1] Unless otherwise stated, the quantities in this table represent crude magnesite mined.

[2] Exports.

[3] Data relate to exports of crude and sintered magnesite, the sintered being reduced to crude on the basis of 2.1 tons of crude to 1 ton sintered. In addition, the following quantities of caustic magnesia were exported in the years under review: 1922, 12,635 tons; 1923, 5,341 tons; 1924, 6,431 tons; 1925, 10,684 tons; 1926, 8,022 tons. In 1922 the companies operating reported an output of 427,556 tons of crude magnesite. Similar data for other years are not available.

[4] Data not available.

[5] Exports, less imports, of crude and sintered magnesite, the sintered being reduced to crude on the basis of 2.1 tons crude to 1 ton sintered.

[6] Year ended Sept. 30.

DOLOMITE [10]

DOLOMITE PRODUCTS

Bowles [11] has reviewed the uses of limestone and dolomite as blast-furnace and open-hearth fluxes and the use of dead-burned dolomite as a refractory furnace lining.

Dolomite sold for uses that are, or have been, also supplied by magnesite decreased in quantity in 1927. The approximate quantity of crude dolomite used in the manufacture of these products is as follows:

Crude dolomite sold by producers in the United States for certain uses, 1918–1927, in short tons

[Includes dead-burned dolomite, basic magnesium carbonate, sulphite process of paper manufacture, and making of carbon dioxide]

1918	1,413,000	1923	1,226,000
1919	947,000	1924	1,239,000
1920	1,580,000	1925	1,425,000
1921	499,000	1926	1,480,000
1922	1,074,000	1927	1,355,000

DEAD-BURNED DOLOMITE

The principal use of dead-burned dolomite is that as refractory material. Some manufacturers of this product buy their stone, the sales of which are reported by the quarry companies in terms of crude stone; others quarry their own stone and report only in terms of dead-burned material. The two kinds of material are represented in the accompanying table, as well as the estimated total output in terms of dead-burned dolomite.

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[10] Figures on dolomite compiled by A. T. Coons, of the Bureau of Mines.

[11] Bowles, Oliver, Utilization Problems of Metallurgical Limestone and Dolomite: Am. Inst. Min. and Met. Eng., Technical Publication No. 62; Class C, Iron and Steel, No. 8 Class H, Nonmetallic Minerals, No. 1.

Dead-burned dolomite sold or used by producers in the United States, 1918–1927

Year	Reported as raw stone		Reported as dead-burned		Total quantity calculated as dead-burned (short tons)
	Short tons	Value	Short tons	Value	
1918	490, 863	$560, 209	318, 896	$4, 097, 819	564, 000
1919	254, 787	394, 754	222, 036	2, 228, 602	349, 000
1920	612, 800	742, 020	316, 293	3, 732. 522	623, 000
1921	79, 480	85, 786	107, 664	1, 113, 010	147, 000
1922	146, 640	172, 251	348, 838	2, 813, 946	422, 200
1923	205, 890	249, 993	357, 642	3, 599, 116	460, 600
1924	309, 010	287, 137	328, 659	3, 209, 257	483, 200
1925	415, 710	375, 315	392, 145	3, 730, 509	600, 000
1926	511, 300	458, 802	386, 715	3, 593, 731	642, 000
1927	434, 160	424, 140	374, 415	3, 459, 803	591, 000

BASIC MAGNESIUM CARBONATE

Basic magnesium carbonate, or "technical carbonate," used in "85 per cent magnesia" pipe and boiler coverings decreased in output in 1927. The manufacturers of this product both buy and quarry their stone but do not report their output of finished product. The crude stone used for this purpose has been reported as follows:

Dolomite sold or used by producers in the United States for manufacture of basic magnesium carbonate, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	90, 989	$126, 255	1923	116, 410	$146, 337
1919	62, 652	82, 619	1924	98, 160	129, 390
1920	57, 300	107, 107	1925	98, 980	131, 440
1921	32, 050	60, 648	1926	72. 850	110, 560
1922	53, 170	79, 313	1927	69, 940	115, 932

HIGH-MAGNESIUM LIME FOR SULPHITE PAPER MILLS

An estimate of the high-magnesium lime sold to sulphite paper mills is given below. Exact figures are impossible to obtain, as many lime producers who sell burned lime to paper mills do not specify the kind of paper mill. The quantity sold is expressed as burned lime.

High-magnesium lime sold by producers in the United States to sulphite paper mills, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	88, 631	$726, 610	1923	75, 000	$750, 000
1919	83, 962	632, 930	1924	70, 000	625, 000
1920	121, 817	1, 347, 321	1925	53. 000	451, 000
1921	68, 992	711, 345	1926	52, 600	482, 000
1922	70, 000	650, 000	1927	50. 000	441, 000

CARBON DIOXIDE

Sales of crude dolomite for the manufacture of carbon dioxide in the last 10 years are as follows:

Dolomite sold by producers in the United States for the manufacture of carbon dioxide, 1918–1927

Year	Short tons	Value	Year	Short tons	Value
1918	16,770	$22,500	1923	38,460	$52,494
1919	16,870	39,895	1924	34,600	57,105
1920	33,040	73,671	1925	19,740	36,854
1921	34,090	124,984	1926	16,520	31,424
1922	38,280	58,748	1927	(1)	(1)

[1] Bureau of Mines not at liberty to publish figures.

MAGNESIUM

PRODUCTION

The sales of domestic metallic magnesium, 1918 to 1927, are given in the table that follows.

Domestic metallic magnesium sold or used in the United States, 1918–1927

Year	Pounds	Value	Average price per pound		Year	Pounds	Value	Average price per pound	
			Ingot	Powder				Ingot	Powder
1918	284,118	$615,217	$1.81	$2.67	1923	[2] 125,000	[2] $155,000	$1.25	$1.00
1919	127,465	247,302	1.83	2.85	1924	[2] 128,000	[2] 150,000	[3] 1.07	[4] 1.10
1920	(1)	(1)	1.60	2.75	1925	245,000	274,400	.86	1.63
1921	48,000	86,000	1.30	2.36	1926	322,650	390,400	.80	1.64
1922	[2] 60,000	[2] 89,000	1.60	1.13	1927	366,400	441,700	[5] .68	1.56

[1] Bureau of Mines not at liberty to publish figures.

[2] Estimated.

[3] Prices ranged from as low as 90 cents in large contracts to $1.10 for small quantities. The published price established about Mar. 1, 1924, was $1.

[4] This price is an average for old powder sold in competition with old imported stocks and for new powder, manufacture of which began in October, 1924, at a sales price of $1.50 a pound.

[5] This price includes that of sales of crude ingots to large consumers for fabricating.

The American Magnesium Corporation, Niagara Falls, N. Y., and the Dow Chemical Co., Midland, Mich., reported production and sale of domestic magnesium made from calcined magnesite and magnesium chloride. The Elektron Metals Corporation of America suspended operations in 1924.

Total sales of domestic magnesium in 1927 increased 14 per cent as compared with 1926. Sixty-nine per cent of the total sales in 1927 was ingot, 3 per cent sheet, 9 per cent powder, 9 per cent castings, and 6 per cent forgings. Sales of ingot increased more than 6 per cent and sales of sheet increased 159 per cent, as compared with 1926, but those of castings decreased 13 per cent.

The great decrease in the average price of ingot does not reflect actual sales conditions during 1927, as most of the sales were made on an 80-cent basis for large lots and a 95-cent basis for smaller lots. It is noteworthy that both of the producers of magnesium are lowering prices with the advance in metallurgical efficiency, notwithstanding the protection of a relatively high tariff.

IMPORTS

Magnesium imported for consumption in the United States, 1918–1927

Year	Pounds	Value		Year	Pounds	Value	
		Total	Average			Total	Average
1918—July to December [1]	11,899	$16,259	$1.37	1923	13,974	$11,576	$0.83
1919	13,239	13,583	1.02	1924	8,738	6,561	.75
1920	29,275	25,055	.85	1925	8,326	7,070	.85
1921	39,913	30,592	.77	1926	10,117	4,750	.47
1922	182,939	54,448	.30	1927	7,131	8,402	1.18

[1] Not separately recorded prior to July, 1918.

Magnesium imported for consumption in the United States, 1926–27, by classes

Class	1926			1927		
	Pounds	Value		Pounds	Value	
		Total	Average		Total	Average
Magnesium, metallic and scrap	7,927	$2,144	$0.270	611	$400	$0.655
Powder (magnesium content)	1,440	1,580	1.097	5,595	6,363	1.137
Sheets, tubing, ribbons, wire, and all other articles of magnesium	750	1,026	1.368	925	1,639	1.772
	10,117	4,750	.470	7,131	8,402	1.178

DEVELOPMENT AND OUTLOOK

Bureau of Standards Circular 346, Light Metals and Alloys—Aluminum and Magnesium, issued in December, 1927, brings together data on properties, statistics, and manufacture of light metals and alloys, gives briefly the most important and fundamental properties of the metals and alloys, and contains references to the literature and a complete bibliography.

Pulsifer [12] has described the structure shown by etching surfaces of magnesium with ammonium salts, has determined the density and hardness of the metal, and discusses the effect of cold working and deformation of magnesium.

Gann and Winston [13] discuss the growth of the magnesium industry, the development of commercial alloys, metallography, foundry practice, and fabrication of various magnesium alloys.

Quotations [14] on price of magnesium during 1927 were as follows: For 8-pound ingots, 75 cents a pound from January to August, 95 cents a pound in September, and 98 cents a pound from October to the end of the year; for 3-pound sticks, 80 cents a pound from January to August, $1 a pound during September and October, and 95 cents to $1 a pound in November and December; for 10-ounce sticks, 90 cents a pound to October and 85 to 90 cents a pound during November and December.

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[12] Pulsifer, H. B., Magnesium—Its Etching and Structure: Am. Inst. Min. and Met. Eng., Technical Publication No. 42, Class E, Institute of Metals, No. 15.

[13] Gann, J. A., and Winston, A. W., Magnesium and Its Alloys: Ind. and Eng. Chem., vol. 19, October, 1927, pp. 1193–1201. (Abstract in Eng. and Min. Jour., vol. 124, December, 1927, p. 1017.)

[14] Engineering and Mining Journal: Vols. 123 and 124, 1927.

The most important development in the industry during 1927 was the increased demand for magnesium for use in the aluminum-magnesium alloys in the manufacture of automobile pistons. This demand at the end of the year was very large and should materially affect the consumption of magnesium during 1928.

MAGNESIUM SALTS

The production of magnesium salts, largely magnesium sulphate and chloride, from natural salts and bittern waters in the United States in 1927 was 69,764,000 pounds, valued at $1,000,850. As there were only two producers each of magnesium chloride and magnesium sulphate, the Bureau of Mines is not at liberty to publish production data separately.

The American Magnesium Co., of Los Angeles, shipped a small quantity of crude magnesium sulphate and magnesium carbonate for experimental purposes from its deposits on the west side of Death Valley, near Wingate Pass. Its plant at Los Angeles is planned to make 20 tons of Glauber's salts, 8 tons of light magnesium carbonate, and 5 tons of Epsom salts per shift.[15]

The California Chemical Corporation has arranged to handle bittern waters from a number of the salt works about San Francisco Bay and will produce magnesium chloride and other products at works at Alvarado and San Mateo, as well as at the Chula Vista plant near San Diego.

The Dow Chemical Co. continued its large production of magnesium chloride and sulphate at its works at Midland, Mich.

The magnesium sulphate deposits at Epso Lake, near Oroville, Wash., now owned by the Magnesium Products Co., of Portland, Oreg., were not productive in 1927.

A reorganization [16] of German makers of magnesium chloride and bromine was concluded on December 3, 1926, to become effective January 1, 1927. The headquarters of the syndicate will be at the offices of the Rock Salt Syndicate in Berlin. The syndicate will sell direct to the United States but will not export liquid chloride. The production of magnesium chloride in Germany in 1926 was estimated at 40,000 metric tons of solid and 42,000 tons of liquid chloride.

German makers of magnesium sulphate have organized the Bitter Salt Syndicate, effective December 3, 1927.[17]

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[15] Engineering and Mining Journal: Vol. 124, 1927, p. 424.

[16] Bureau of Foreign and Domestic Commerce, World Trade Notes on chemicals and allied products, vol. 1, No. 4, Feb. 5, 1927, pp. 2–4.

[17] Commerce Reports, Jan. 16, 1928, p. 173.

Magnesium chloride imported for consumption in the United States, 1918–1927

Year	Anhydrous			Total		
	Pounds	Value		Pounds	Value	
		Total	Average		Total	Average
1918	(1)	(1)	----------	[2] 13,076	[2] $1,619	$0.124
1919	(1)	(1)	----------	11,200	538	.048
1920	(1)	(1)	----------	454,334	7,098	.016
1921	(1)	(1)	----------	7,365,812	85,727	.012
1922	(1)	(1)	----------	11,403,837	113,618	.010
1923	56,110	$2,703	$0.048	23,052,385	190,748	.008
1924	136,082	1,820	.013	15,200,433	85,206	.006
1925	----------	----------	----------	15,922,254	105,462	.007
1926	----------	----------	----------	16,093,867	110,477	.007
1927	44,374	315	.007	8,185,363	59,950	.007

[1] Not separately recorded.

[2] Not separately recorded prior to July, 1918.

Magnesium sulphate (Epsom salts) imported for consumption in the United States, 1918–1927

Year	Pounds	Value		Year	Pounds	Value	
		Total	Average			Total	Average
1918	2,045	$196	$0.0958	1923	14,455,920	$71,566	$0.0050
1919	17,647	1,473	.0835	1924	8,881,181	57,579	.0065
1920	1,803,769	66,944	.0371	1925	8,211,228	50,466	.0061
1921	12,519,778	88,153	.0070	1926	10,600,582	61,018	.0058
1922	25,390,734	200,203	.0079	1927	11,620,675	60,527	.0052

Imports of magnesium compounds, not shown elsewhere in this report, are given in the table that follows.

Magnesium compounds imported for consumption in the United States, 1918–1927

Year	Calcined magnesia, purified		Carbonate, precipitated		Year	Calcined magnesia, purified		Carbonate, precipitated	
	Pounds	Value	Pounds	Value		Pounds	Value	Pounds	Value
1918	523	$312	----------	----------	1923	141,375	$30,802	1,046,990	$55.137
1919	22,637	11,358	5,094	$1,101	1924	101,998	29,252	481,439	25,333
1920	26,859	9,093	14,930	1,512	1925	162,790	43,356	190,413	13.004
1921	35,182	7,593	18,514	2,061	1926	520,394	51,454	241,293	16,142
1922	96,792	15,969	36,254	3,385	1927	259,357	48,093	348.383	20.115

TALC AND SOAPSTONE[1]

PRODUCTION

The total quantity of talc sold by producers in the United States in 1927 amounted to 192,316 short tons, valued at $2,234,724. The figures for 1927 include 5,706 tons of crude talc, valued at $25,365; 1,494 tons of sawed and manufactured talc, valued at $111,650; and 185,116 tons of ground talc, valued at $2,097,709. There were 21 producers of talc operating 21 talc mines in 1927.

Crude talc, other than refractory grade, was sold in California, Maryland, Vermont, and Virginia. Crude (refractory grade) was mined and sold in Maryland only. Other high-grade massive talc was mined and sold in Georgia, North Carolina, and Vermont.

Most of the crude talc sold (other than refractory grade) is eventually ground; massive talc suitable for refractory purposes, which must be very fine grained, is manufactured into "lava" tips for gas burners; other high-grade massive talc is used chiefly in the manufacture of pencils, tailors' chalk, metal-workers' crayons, and in electric insulation. As the foregoing figures show, by far the larger part of the talc mined in the United States is used in the ground form as a filler in paper, paint, and rubber-goods manufacture, in toilet preparations, for electric insulation, as a lubricant, as a bleaching, cleaning, and polishing agent, for acid proofing and fireproofing, and in many other ways.

In 1927 soapstone was mined, manufactured, and sold in Virginia, but the Bureau of Mines is not at liberty to publish the figures.

Massive soapstone is marketed only in the manufactured form, there being little, if any, demand for crude soapstone. Much of the Virginia soapstone, however, is suitable for grinding, and when ground it usually is classed commercially as talc; it is of rather low grade and is best suited for foundry facings, rubber manufacture, for making concrete, as a lubricant, and for use in roofing compounds.

Massive high-grade soapstone is cut into slate pencils and metal-workers' crayons, but by far the larger quantity is manufactured into laundry tubs and sinks; it is used also in chemical laboratories in the form of tables, hoods, sinks, and tanks.

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[1] Figures on production compiled by B. H. Stoddard, of the Bureau of Mines. Data on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Talc and soapstone sold by producers in the United States, 1918–1927, by classes

Year	Crude		Sawed and manufactured				Ground		Total	
			Talc		Soapstone					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1918	17, 633	$193, 278	1, 075	$116, 952	12, 330	$501, 059	177, 269	$1, 869, 730	208, 307	$2, 681, 019
1919	15, 625	73, 437	921	147, 339	16, 504	530, 163	151, 793	1, 601, 736	184, 843	2, 352, 675
1920	11, 008	43, 820	1, 415	139, 335	19, 707	709, 400	178, 505	2, 142, 894	210, 635	3, 035, 449
1921	2, 150	12, 911	(1)	(1)	[1] 17,423	[1] 627, 826	102, 413	1, 115, 205	121, 986	1, 755, 942
1922	4, 981	22, 582	654	86, 333	22, 700	712, 144	170, 349	2, 038, 838	198, 684	2, 859, 897
1923	5, 706	50, 125	682	114, 772	22, 857	932, 098	167, 447	1, 915, 258	196, 692	3, 012, 253
1924	5, 710	22, 247	846	109, 405	25, 630	1, 288, 885	171, 635	2, 095, 019	203, 821	3, 515, 556
1925 [2]	5, 684	24, 533	895	107, 691	(3)	(3)	175, 677	1, 879, 569	182, 256	2, 011, 793
1926 [2]	5, 988	26, 723	1, 528	130, 253	(3)	(3)	174, 052	1, 954, 018	181, 568	2, 110, 994
1927 [2]	5, 706	25, 365	1, 494	111, 650	(3)	(3)	185, 116	2, 097, 709	192, 316	2, 234, 724

[1] Talc included under "Soapstone."
[2] Figures represent talc only.
[3] Bureau of Mines not at liberty to publish figures for soapstone.

Talc sold by producers in the United States, 1925–1927, by States

State	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
California	14, 883	$194, 975	15, 419	$233, 292	15, 760	$238, 755
Georgia	5, 022	76, 028	4, 220	89, 000	3, 110	42, 370
Maryland	2, 718	35, 488	2, 857	41, 780	(1)	(1)
New Jersey and Pennsylvania	9, 206	90, 502	8, 097	74, 120	(1)	(1)
New York	85, 109	993, 913	83, 231	1, 030, 075	94, 553	1, 191, 453
North Carolina	(1)	(1)	(1)	(1)	(1)	(1)
Vermont	54, 883	533, 603	53, 510	514, 527	54, 688	503, 716
Virginia	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed	10, 435	87, 284	14, 234	128, 200	24, 205	258, 430
	182, 256	2, 011, 793	181, 568	2, 110, 994	192, 316	2, 234, 724

[1] Included under "Undistributed."

The separation of the quantities and values for talc sold by producers, in accordance with the quality of the talc and the demand for the different uses, which in turn determine the manner of preparation for the market, is given in the table that follows. In 1925, 1926, and again in 1927, 3 per cent was sold rough (crude) as it came from the mine; less than 1 per cent was sold as cut pencils and crayons and as blanks used for refractory purposes, and 96 per cent was ground to talc powder.

Talc sold by producers in the United States, 1925–1927, by classes

Form in which sold	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Rough (crude)	5, 684	$24, 533	5, 988	$26, 723	5, 706	$25, 365
Sawed and manufactured [1]	895	107, 691	1, 528	130, 253	1, 494	111, 650
Ground [2]	175, 677	1, 879, 569	174, 052	1, 954, 018	185, 116	2, 097, 709
	182, 256	2, 011, 793	181, 568	2, 110, 994	192, 316	2, 234, 724

[1] For slate pencils and metal-workers' crayons and for blanks used in making acetylene burners and other objects.
[2] For filler in paper, paint, and rubber goods, and for toilet powder, foundry facings, textiles, lubricators, electric insulation, etc.

LIST OF PRODUCERS

Producers of talc and soapstone in the United States in 1927

Name and address	Location of mine
CALIFORNIA	
Ganim Gold Mines Co., Redding	2 miles west of Schilling, Shasta County.
W. S. McLean, 639 Brannan Street, San Francisco	Butte County and near Latrobe, Eldorado County.
Martin Minerals Co., 1901–1929 East Slausen Avenue, Los Angeles.	Acme, San Bernardino County.
Pacific Coast Talc Co., 2149 Bay Street, Los Angeles	7 miles north of Silver Lake station, San Bernardino County.
Sierra Talc Co., 401 Equitable Bank Building, Los Angeles.	18 miles from Keeler, Inyo County.
Western Talc & Magnesite Co., Los Angeles	Tecopa, Inyo County.
GEORGIA	
Georgia Talc Co., Asheville, N. C	Foot of Cohutta Mountain, 3¼ miles southeast of Chatsworth, Murray County.
MARYLAND	
Harford Talc Co. (Inc.), 1801 Chelsea Road, Baltimore	Near Dublin, Harford County.
Herbert I. Oursler, Marriottsville	¼ mile west of Henryton, Carroll County.
NEW JERSEY	
Rock Products Co., 403 Trust Building, Easton, Pa	Above Marble Hill, on Delaware River, near Phillipsburg, Warren County.
NEW YORK	
Carbola Chemical Co. (Inc.), Natural Bridge	1¼ miles from Natural Bridge, Lewis County.
International Pulp Co., 41 Park Row, New York City	Talcville, St Lawrence County.
W. H. Loomis Talc Corporation, 173 East Main Street, Gouverneur.	Fowler, St. Lawrence County.
NORTH CAROLINA	
North Carolina Talc & Mining Co., Hewitts	Hewitts, Swain County.
Standard Mineral Co. (Inc.), Hemp	2½ miles from Hemp, Moore County.
PENNSYLVANIA	
C. K. Williams & Co., 640 North Thirteenth Street, Easton.	Near Easton, Northampton County.
VERMONT	
American Soapstone Finish Co., Chester	2½ miles from Chester, Windsor County.
Eastern Magnesia Talc Co. (Inc.), Burlington	East Granville, Addison County; Rochester, Windsor County; and Waterbury, Washington County.
Vermont Talc Co., Chester	Windham, Windham County.
VIRGINIA	
Blue Ridge Talc Co. (Inc.), Henry	¾ mile east of Henry station, Franklin County
Bull Run Talc & Soapstone Co. (Inc.), Clifton Station	3 miles north of Clifton, Fairfax County.
Standard Soapstone Corporation, 341 Madison Avenue, New York, N. Y.	Near Arrington, Nelson County.
Virginia Alberene Corporation, 153 West Twenty-third Street, New York, N. Y.	Schuyler, Nelson County.

In 1927 talc in the crude state was worth $3.50 to $6.50 a ton; the price of manufactured talc (talc crayons) ranged from about $75 to $440 a ton and of ground talc from $5 to $27 a ton.

Soapstone in rough quarry blocks or in crude state is worth $5 to $10 a ton. Reports of producers showed, however, that no soapstone was sold in that form in 1927. When sawed into slabs and manufactured into laundry tubs, laboratory-table tops, and other products, its value increases greatly.

REVIEW BY STATES

California.—In 1927 sales of talc by producers increased 2 per cent in both quantity and value as compared with 1926. The sales were made by the same producers (six in number) as in 1926. Most of the talc mined in California is used for making talcum powder; the requirements for this purpose are freedom from grit or harmful impurities, such as iron and lime, pure white or flesh color, and good slip. Some California talc, however, is used as a filler in paper, paint, soap, and rubber manufacture. The average value of crude talc shipped in 1927 was $6.35 a ton f. o. b. mines and in 1926, $6.59; the average value of ground talc was $17.24 a ton f. o. b. mills in 1927 and $17.08 in 1926. These were the only grades sold by producers in California in 1926 and 1927.

Georgia.—The Georgia Talc Co. was the only producer of talc in the State in 1927. Most of the product was sold in the ground form, but some was used in the manufacture of crayons, of which there was a large increase in both quantity and value.

Maryland.—The total sales of talc by producers increased in both quantity and value as compared with 1926. Two producers, one less than in 1926, reported sales in 1927; they were the Harford Talc Co. (Inc.), which mines a refractory talc, and Herbert I. Oursler, who shipped talc schist.

New Jersey and Pennsylvania.—The sales of talc by producers in New Jersey and Pennsylvania were made in the ground form, and the sales in New Jersey were largely in excess of the quantity sold in 1926.

New York.—New York outranked all other States in the quantity and value of talc sold in 1927. The product was sold by the same producers as in 1926, namely, the Carbola Chemical Co. (Inc.), the International Pulp Co., and the W. H. Loomis Talc Corporation. All the talc was sold in the ground form at an average of about $13 a ton. The W. H. Loomis Talc Corporation continued experiments with its product, a short-fiber talc known as "loomite," in the manufacture of waterproof concrete, for which new markets have been developed.

North Carolina.—The Standard Mineral Co. (Inc.) mined pyrophyllite at its property near Hemp, Moore County. The North Carolina Talc & Mining Co. operated its property at Hewitts, Swain County; the product was manufactured and shipped as talc crayons.

Vermont.—Vermont was the second largest producer of talc in the United States in 1927. Sales by producers increased slightly in quantity but decreased in value, compared with 1926. The talc was sold crude, manufactured (in the form of crayons), and ground. The bulk of the output, however, was used in the ground form by the paper, rubber, and roofing trades.

Virginia.—Talc was mined and shipped in Virginia by the Blue Ridge Talc Co. (Inc.) and the Bull Run Talc & Soapstone Co. (Inc.). The Virginia Alberene Corporation continued the operation of the Schuyler soapstone quarries in Nelson County. Soapstone was also produced, manufactured, and sold by the Standard Soapstone Corporation. The crude soapstone at both properties was manufactured and sold in the form of sinks, tubs, slabs, furnace blocks, floor tiles, electric disks, laboratory equipment, and in other forms.

USES

Powdered talc and soapstone are used extensively in the paper, paint, roofing, rubber, foundry, and textile industries and for toilet preparations. Massive talc of the variety known as "lava" grade, free from iron and grit, with no cracks or cleavage planes, is cut into gas tips, blanks for electric insulation, and spark plugs. Only small amounts of this variety are produced in the United States. Talc is also made into crayons and pencils, is used in glass making, and as a polishing agent. Massive soapstone is manufactured into laundry tubs, trays, sinks, laboratory-table tops, store fronts, bus-bar compartments, electric insulating material, acid tanks, stair treads, furnace blocks, fuse guards, tiles, treads, aquariums, switchboards, panel boards, bases, insulators, wainscoting, fireless-cooker stones, hearth linings, furnace linings, and griddles.

IMPORTS AND EXPORTS

Talc imported for consumption in the United States, 1918–1927

Year	Crude and unground steatite and French chalk		Manufactures (except toilet preparations) wholly or partly finished [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	1, 434	$9, 253	12, 735	$251, 323	14, 169	$260, 576
1919	1, 641	10, 105	12, 961	248, 899	14, 602	259, 004
1920	941	7, 206	21, 739	443, 514	22, 680	450, 720
1921	153	2, 279	11, 468	239, 469	11, 621	241, 748
1922	248	9, 850	18, 196	367, 528	18, 444	377, 378
1923	560	20, 653	19, 405	402, 238	19, 965	422, 891
1924	313	4, 847	17, 496	337. 508	17, 809	342, 355
1925	121	6, 547	20, 872	443, 985	20, 993	450. 532
1926	199	16, 366	23, 642	523, 716	23, 841	540, 082
1927	377	27, 326	24, 817	523, 056	25, 194	550, 382

[1] Prior to Sept. 22, 1922, the classification was "Talc, steatite, and French chalk—cut, ground, or washed."

Talc, ground or unground, imported into the United States, 1926 and 1927, by countries

[General imports]

Country	1926		1927	
	Short tons	Value	Short tons	Value
Austria	74	$2, 391	88	$2, 750
Belgium	102	5, 536	585	3, 023
Canada	9, 735	112, 988	9, 599	112, 713
China	126	78, 310	101	59, 832
Czechoslovakia	(1)	20		
France	6, 326	105, 594	6, 278	89, 001
Germany	73	3, 097	2	418
Hong Kong			(1)	92
India (British)	30	1, 426	155	8, 757
Iraq	(1)	14		
Italy	7, 776	241, 234	8, 186	258, 083
Jamaica			19	289
Japan	5	5, 486	3	6, 354
Spain	(1)	9	66	1, 522
Switzerland			1	98
United Kingdom	99	7, 694	40	2, 353
	24, 316	563, 799	25, 123	545, 285

[1] Less than 1 ton.

Exports of talc in bulk are not recorded. The exports of "talcum and other toilet powders" in 1922 amounted to 1,821 short tons, valued at $1,397,542; in 1923, 1,907 tons, valued at $1,671,588; in 1924, 1,614 tons, valued at $1,688,211; in 1925, 1,734 tons, valued at $1,882,196; in 1926, 1,645 tons, valued at $1,726,933; and in 1927, 1,627 tons valued at $1,621,068. Similar exports were not separately classified prior to 1922.

WORLD PRODUCTION

World's production of talc and soapstone, 1923–1927, by countries, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country [1]	1923	1924	1925	1926	1927
Australia:					
New South Wales	207	543	711	366	488
South Australia	425	330	358	560	629
Austria (exports)	7,489	9,587	12,883	13,846	(2)
Canada	9,404	10,280	13,131	14,304	14,988
France	48,780	69,350	69,352	(2)	(2)
Germany (Bavaria)	1,907	3,997	3,461	3,834	6,381
Great Britain	189	----------	----------	----------	----------
Greece	132	139	94	151	139
India (British)	7,137	2,898	8,662	9,829	5,134
Italy	31,189	32,208	33,662	43,075	32,940
Japan [3]	35,918	41,867	44,094	(2)	(2)
Norway	8,907	11,785	9,032	7,608	(2)
Rumania	(2)	51	122	488	1,138
Russia [4]	(2)	(2)	569	2,995	(2)
Spain	1,983	1,977	1,771	1,658	3,843
Sweden	[5] 2,430	[5] 2,873	[5] 2,374	[5] 3,221	3,475
Union of South Africa (Transvaal)	322	575	60	76	294
United States	178,435	184,902	[6] 165,339	[6] 164,715	[6] 174,465
Uruguay (exports)	996	1,760	913	897	1,103

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[1] In addition to the countries listed, Brazil produces a small quantity of talc, and China produces both talc and soapstone. No data of production are available for Brazil; exports of talc were reported as 120 kilograms in 1924 and 158 kilograms in 1925; no exports are reported for later years. China's output of talc in 1925 is officially estimated at 31,516 tons; similar data are not available for other years. No figures are available on the production of unmanufactured soapstone; the output of soapstone ware in 1925 is reported as 112 tons. (Hsieh, C. Y., Special Rept. No. 2, China Geol. Survey, Peking, 1926.)

[2] Data not available.

[3] Includes agalmatolite.

[4] Year ended Sept. 30.

[5] Exclusive of a small quantity for which value only is given.

[6] Figures represent talc only. Bureau of Mines not at liberty to publish figures for soapstone.

MICA[1]

By B. H. STODDARD [2]

PRODUCTION

The total quantity of uncut mica sold by producers in the United States in 1927 was 7,036 short tons, valued at $322,621. Of this quantity 1,512,492 pounds (756 tons), valued at $212,482, was sheet mica; the rest was scrap mica. These figures indicate a decrease in sheet mica of 30 per cent in quantity and 47 per cent in value and a decrease in scrap mica of 11 per cent in quantity and 19 per cent in value, as compared with 1926. The chief producing States in 1927 were, as usual, New Hampshire and North Carolina. Sales of uncut sheet mica decreased 48 per cent in quantity and 67 per cent in value in New Hampshire and 5 per cent in quantity and 24 per cent in value in North Carolina.

The average value at points of production of all sheet mica sold by producers in the United States in 1927 was 14 cents a pound, as compared with 18 cents in 1926, and the average value of scrap mica was about $18 a short ton in 1927, as compared with about $19 in 1926.

Mica sold by producers in the United States, 1918–1927 [a]

Year	Sheet mica [a]		Scrap mica		Total [a]	
	Pounds	Value	Short tons	Value	Short tons	Value
1918	1,644,200	$731,810	2,292	$33,130	3,114	$764,940
1919	1,545,709	483,567	3,258	58,084	4,031	541,651
1920	1,683,480	546,972	5,723	167,017	6,565	713,989
1921	741,845	118,513	2,577	56,849	2,948	175,362
1922	1,077,968	194,301	[b] 6,641	114,045	[b] 7,180	308,346
1923	2,063,179	311,180	[b] 8,054	129,695	[b] 9,086	440,875
1924	1,460,897	212,035	4,709	87,242	5,439	299,277
1925	1,793,865	321,962	9,695	173,537	10,592	495,499
1926	2,172,159	400,184	7,043	136,643	8,129	536,827
1927	1,512,492	212,482	6,280	110,139	7,036	322,621

[a] For 1920 and later years the figures for sheet mica represent uncut sheet exclusively; for earlier years some cut sheet was included.

[b] Includes mica derived from mica schist.

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[1] Discussion of the occurrence, mining, preparation, and uses of mica may be found in the chapters of this series in Mineral Resources of the United States, for 1925 and 1926, part 2.

[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Mica sold by producers in chief producing States, 1923–1927

State and year	Sheet mica			Scrap mica		Total	
	Pounds	Short tons	Value	Short tons	Value	Short tons	Value
New Hampshire:							
1923	835, 751	418	$107, 674	1, 078	$25, 871	1, 496	$133, 545
1924	744, 133	372	88, 737	492	9, 498	864	98, 235
1925	1, 120, 857	560	198, 858	1, 953	47, 525	2, 513	246, 383
1926	1, 371, 890	686	235, 890	1, 738	38, 213	2, 424	274, 103
1927	720, 219	360	78, 849	1, 284	22, 909	1, 644	101, 758
North Carolina:							
1923	1, 130, 283	565	188, 317	[1] 5, 005	65, 764	[1] 5, 570	254, 081
1924	597, 385	299	108, 656	3, 212	59, 620	3, 511	168, 276
1925	592, 478	296	105, 376	5, 095	74, 818	5, 391	180, 194
1926	700, 313	350	150, 362	2, 880	54, 048	3, 230	204, 410
1927	665, 360	333	114, 514	2, 995	50, 505	3, 328	165, 019

[1] Includes mica derived from mica schist.

REVIEW BY STATES

Alabama.—The output of mica in Alabama in 1927 was reported by dealers who purchased from small operators.

Colorado.—Sales of scrap mica in Colorado were made by E. W. Lehman who operated the High Line mine, near Jamestown, Boulder County, and by Henry Ramstetter, who operated the Ramstetter quarry near Golden, Jefferson County. The Chief Idaho Mica Co., Idaho Springs, which is in process of organization, contemplates in the near future the operation of the Chief Idaho mine in Clear Creek County (nearest town Idaho Springs). The mine-run product will be shipped to the Central States for cutting and grinding.

Connecticut.—The Eureka Flint & Spar Co., Trenton, N. J., operated by lease the Strickland mine, 2½ miles northeast of Portland, Middlesex County, and sold the product as mine run.

Georgia.—The only output reported to the Bureau of Mines from Georgia in 1927 was from the Wacaster Mica Co., and was obtained from the "Billie" mine near Hollysprings, Cherokee County.

Idaho.—No sales of mica were reported from Idaho in 1927. The Mica Queen Group of claims, 15 miles southeast of Council in Adams County, was further developed by tunneling, and according to a statement of the Gifford & Huntington Co., of Council, shipments will be made within a few months. The Troy Mica Co., Troy, reported a small production of mica but no shipments; development at the deposit consists of several hundred feet of underground workings; the company has installed modern machinery at the plant and expects to prepare the product for the market.

Maine.—Harold C. Perham worked the Hibbs mine, 1½ miles north of Hebron, Oxford County, under lease from J. A. Hibbs, of Hebron. This mine was first opened in 1906 and at that time a promising future was indicated for both feldspar and mica. United States Geological Survey Bulletin 740, by Douglas B. Sterrett, gives a full description of the mine. The mine is being operated for both feldspar and mica. Mr. Perham reports that the mica is amber-colored, very clear, and is successfully used for chimney canopies and for other products requiring exceptionally clear, flawless mica. He also states that there is a large amount of "book" mica, from which 1 to 7 inch squares can be cut. The product is sold f. o. b. cars Hebron, in the following forms: Mine run, "cobbed," and scrap.

Nevada.—The only operations in Elk County, Nev., in 1927 were those conducted by Sherwood Grover, 558 Twenty-fourth Street, Oakland, Calif., for the Mutual Mica Co., at its property 6 miles south of Ruby Valley. The property is reported to embrace five claims and a mill site, all in the Ruby Mountains. Before 1926 development work, which was in charge of Fred Bender, who located the property, consisted of a crosscut tunnel driven 240 feet to penetrate a series of dikes at depth; in 1926 an air compressor and a Diesel engine were being installed to furnish sufficient power for the tunnel work and for the operation of a small mill to extract and treat the mica. Mr. Grover reported sales of clear mica in 1927; although these sales were of punch and washer mica, sheets ranging from 2 inches to 2 feet in diameter are said to have been found; samples were shipped to mica mills for grinding. The mine was later shut down. It is reported that the property was purchased in October, 1927, by C. W. Kennedy, 285 Van Buren Avenue, Oakland, Calif.

New Hampshire.—New Hampshire, one of the two principal mica-producing States, produced 48 per cent of the total quantity of domestic sheet mica sold by producers in the United States in 1927, as compared with 63 per cent of the total in 1926. This decrease was largely the result of curtailment of operations by the Standard Feldspar Co. at Rumney Depot; the company operated only the Valencia mine in 1927. The Alexandria mine in Grafton County, owned by the General Electric Co., of Schenectady, N. Y., increased its output, all of which was consumed by the company. Leon Allen, Spragueville Road, Keene, sold a small amount of punch mica from his mine on Surry Mountain, near Surry, Cheshire County. Herman E. Craig operated the Millwoods Hill mine, near Alstead, Cheshire County, and reported sales for the first time from the mine of both sheet and scrap mica. The Golding-Keene Co., Keene, operated the Golding-Keene mine at Alstead, Cheshire County; the output was sold in the mine-run form. John T. Hanley operated the Streeter mine at Dorchester, Grafton County; the production was again sold to eastern consumers. H. N. Kirk, Keene, operated the Kirk (formerly Tatelman) mine at Gilsum, Cheshire County, but the product was not prepared for sale. The New England Mica Co., owners of the Ruby mine at Grafton, reported sales of washer and scrap mica to an eastern consumer. The New England Minerals Co. (Inc.) reported the operation of "several mines," the product from which was manufactured by the company into washer and disk stock and sold direct to consumers; the scrap mica produced by this company is ground by the dry process and sold in powdered form. The New Hampshire Mica & Mining Co. operated the French mine at Alstead, Cheshire County; the product is sheet mica in several sizes, from punch or washer to 6 by 8 inches and larger. The entire output is manufactured and sold by the company for use in electrical insulation.

New Mexico.—E. D. Grube reported that sheet and scrap mica produced at the Coates mine of the New Mexico Mica Co. in Rio Arriba County, near Petaca, were sold to a Chicago consumer. The Hoyt Mineral Corporation operated the Las Tablas mines, near Las Tablas, Rio Arriba County. The entire output was scrap mica and was sold to Chicago and Denver consumers. The American Mica Products Co., Chicago, Ill., reported that operations at its property near La Madera, Rio Arriba County, were suspended during the year. Assessment work was carried on at the Silver Plate mine, 4 miles west of Petaca, Rio Arriba County, by H. A. Stark, Petaca, for the Mica Industries Co. (Ltd.); the company expects to begin operations in 1928. Similar work was undertaken at the Ortez No. 1, La Jasita, and El Paso claims in Rio Arriba County near Las Tablas, by the Eureka Mica & Mining Co., of Vaughn. The several claims leased by H. K. Thurber, Ojo Caliente, which made an initial shipment of scrap mica in 1926, were idle in 1927. According to a statement by Mr. Thurber operations will be resumed in 1928.

North Carolina.—Sales of sheet mica by producers in North Carolina in 1927 were 44 per cent of the total quantity of sheet mica sold by producers in the United States, as compared with 32 per cent of the total in 1926, although they decreased 5 per cent in quantity and 24 per cent in value as compared with 1926. Sales of scrap mica in 1927 increased 4 per cent in quantity as compared with 1926 and were 48 per cent of the total scrap mica sold by producers. Average values in 1927 were 17 cents a pound for sheet mica and $17 a ton for scrap mica. The Franklin Mineral Products Co. reported its first sales of scrap mica from the Burr Knob mine in Macon County. The General Mica & Clay Co., Franklin, and the Iotla Clay & Mica Co., Iotla, were succeeded by the Southern Mica Co. Norman G. Smith & Co. (Inc.), operating the Smith No. 1 mine, Mitchell County, was another new mica producer. The material is recovered as a by-product in kaolin washing.

The list that follows contains the names of all producers of mica in North Carolina who reported sales for 1927 and the names and locations of the mines operated by them, but it is possible that there were other producers whose reports the Bureau of Mines did not receive. However, the statistics are essentially complete for this State, as the reports from producers have been supplemented by reports from buyers and others engaged in the industry.

Producers of mica in North Carolina making sales in 1927

Name and address	Name of mine	Location of mine	
		Nearest town	County
J. L. Bailey, Spruce Pine	Twin Pines	Spruce Pine	Mitchell.
J. A. Bartlett, Spruce Pine		do	Do.
J. C. Burgin, Celo			Yancey.
J. E. Burleson, Spruce Pine	Big Ridge	Waynesville	Haywood.
	Birch		Avery.
Carolina Mineral Co., Spruce Pine	Hoot Owl	Estatoe	Mitchell.
Erwin Feldspar Co., Spruce Pine	Crabtree	Crabtree	Haywood.
	Avery	Plumtree	Avery.
	English Knob	Spruce Pine	Mitchell.
	Hawkins	do	Do.
Franklin Mineral Products Co., Franklin	Burr Knob	Franklin	Macon.
James A. Mayberry, Spruce Pine	Gibbs	Newdale	Yancey.
E. H. Patrick & Co., Plumtree		Plumtree	Avery.
J. C. Pitman & Co., Penland	Davis	Penland	Mitchell.
Rickman, Wright, Reuss & Sisk, Franklin	Boyd Knob	Franklin	Macon.
Norman G. Smith & Co. (Inc.), Spruce Pine	Smith No. 1	Spruce Pine	Mitchell.
Southern Mica Co., Franklin	Cowee	Franklin	Macon.
	Iotla Bridge	do	Do.
Spruce Pine Mica Co., Spruce Pine	No. 10	Spruce Pine	Mitchell.
Tennessee Mineral Products Co., Spruce Pine	Cook	do	Do.
	Deake	do	Do.
	Deer Park	do	Do.
	Smith	do	Do.
W. W. Wiseman, Ingalls	Wiseman	do	Do.

South Dakota.—The sales of scrap mica in South Dakota in 1927 were larger than those reported for 1926. No sales of sheet mica were reported. The Keystone Feldspar & Chemical Co. operated the Peerless and Hugo mines near Keystone; its output of scrap mica was sold to consumers in Chicago. The mines are leased from the Reinbold Metallurgical Co., Omaha, Nebr. W. D. Wood operated the Custer mine, 5 miles north of Custer, and sold its output of scrap mica to consumers in Illinois and Indiana.

Texas.—Information was received by the Bureau of Mines to the effect that the Micolithic Co., of Van Horn, was developing extensively its property in Culberson County, near Van Horn; the bureau, however, was unable to obtain a report from the company.

Virginia.—E. G. Adams operated the Griggs mine, near Martinsville, Henry County; the output was both sheet and scrap mica. The Pegmatite Minerals Co. reported for the first time sales of sheet and scrap mica from the Jones, Ligon, and Rutherfoord mines on Appomattox River, in Amelia County.

Wyoming.—Unverified information has been received by the Bureau of Mines that a mica property in Carbon County, near Encampment, is being operated, and that the Thomas process is to be used in separating the scrap mica from foreign material.

SCRAP AND GROUND MICA

PRODUCERS OF SCRAP MICA

Following is a list of producers of scrap mica in 1927:

E. G. Adams, Martinsville, Va.
J. L. Bailey, Spruce Pine, N. C.
J. C. Burgin, Celo, N. C.
Carolina Mineral Co., Spruce Pine, N. C.
Herman E. Craig, East Alstead, N. H.
Erwin Feldspar Co., Spruce Pine, N. C.
Franklin Mineral Products Co., Franklin, N. C.
General Electric Co., Schenectady, N. Y. (mine in New Hampshire).
E. D. Grube, Petaca, N. Mex.
J. T. Hanley, Cheever, N. H.
Hoyt Mineral Corporation, Las Tablas, N. Mex.
Keystone Feldspar & Chemical Co., Keystone, S. Dak.
E. W. Lehman, Jamestown, Colo.
James A. Mayberry, Spruce Pine, N. C.
New England Mica Co., 66 Woerd Avenue, Waltham, Mass. (mine in New Hampshire).
New England Minerals Co. (Inc.), 85 Devonshire Street, Boston, Mass (mine in New Hampshire).
New Hampshire Mica & Mining Co., Keene, N. H.
E. H. Patrick & Co., Plumtree, N. C.
Pegmatite Minerals Co., Chula, Va.
Harold C. Perham, Paris, Me.
J. C. Pitman & Co., Penland, N. C.
Henry Ramstetter, R. R. 4, Golden, Colo.
Spruce Pine Mica Co., Spruce Pine, N. C.
Standard Feldspar Co., Rumney Depot, N. H.
Tennessee Mineral Products Co., Spruce Pine, N. C.
Wacaster Mica Co., Hollysprings, Ga.
W. W. Wiseman, Ingalls, N. C.
W. D. Wood, Custer, S. Dak.

GRINDERS OF SCRAP MICA

Following is a list of grinders of scrap mica in 1927, with the process used:

	Process
Asheville Mica Co., Biltmore, N. C	Dry.
English Mica Co., Spruce Pine, N. C	Wet.
Hoyt Mineral Corporation, Las Tablas, N. Mex	Dry.
New England Minerals Co. (Inc.), 85 Devonshire Street, Boston, Mass	Dry.
New Hampshire Mica & Mining Co., Keene, N. H	Wet.
Richmond Mica Co., 801 East Main Street, Richmond, Va	Wet.
Southern Mica Co., Franklin, N. C	----
Standard Oil Co., 910 South Michigan Avenue, Chicago, Ill	Dry.
U. S. Mica Manufacturing Co., Chicago, Ill	Dry.
D. T. Vance, Plumtree, N. C	Wet.
Western Elaterite Roofing Co., Denver, Colo	Dry.

Mica which is not suitable for use as sheet mica is classed as "scrap" mica. It is ground to a powder and used in the decorative trade in the manufacture of wall paper, fancy paint, ornamental tile, and concrete facing, and for other purposes; as a lubricant both dry, as for auto tires, and mixed with oil and greases; for axle grease; for annealing steel; as a dusting agent for rolled roofing; for the manufacture of Christmas-tree snow; as an insulator for pipe and boiler covering; fireproof paint; and in various other ways.

Mica used in the wall-paper trade is practically all ground to 160 mesh by the wet process. For the rubber industry, as for auto tires, it is ground by both the dry and wet processes to 100, 160, and 200 mesh; for the roofing industry it is ground by the dry process to the following meshes: 6-15, 20, 20-special, and 24.

Descriptions of the dry and wet processes for grinding mica are contained in the Bureau of Mines Report of Investigations by W. M. Myers, Serial No. 2798, March, 1927.

The following figures distribute the 1927 sales of ground mica by methods of grinding and by consuming industries in the United States, in so far as reported by producers. The figures do not represent the total production of ground mica in the United States, for in addition to the part of the production which is shipped to foreign consumers there is also unaccounted for a part of the scrap-mica output which has not been traced to points of consumption where it may be ground by the consumers.

Ground mica sold in the United States, 1923–1927, by methods of grinding

Year	Dry ground		Wet ground		Total	
	Pounds	Value	Pounds	Value	Pounds	Value
1923	5, 660, 000	$123, 450	4, 203, 000	$250, 170	9, 863, 000	$373, 620
1924	5, 184, 000	101, 700	5, 735, 000	331, 410	10, 919, 000	433, 110
1925	5, 043, 020	101, 680	4, 803, 930	279, 940	9, 846, 950	381, 620
1926	4, 750, 790	98, 290	4, 980, 400	206, 370	9, 731, 190	304, 660
1927	5, 187, 063	90, 968	6, 398, 320	332, 511	11, 585, 383	423, 479

Ground mica sold to various industries in the United States in 1927

Industry	Quantity		Value
	Pounds	Percentage	
Wall paper	3,767,925	33	$192,091
Rubber	3,176,743	27	144,594
Roofing	2,584,900	22	34,347
Miscellaneous[1]	2,055,815	18	52,447
	11,585,383	100	423,479

[1] Figures cover mica used for molded electric insulation, surfacing on asphalt shingles, filler for fancy paints, Christmas-tree snow, manufacture of axle greases and oil, annealing, and concrete facing.

CLASSIFICATION

Mica is valuable in sheet form and as scrap suitable for grinding into a powder. For commercial sheet mica the individual pieces must be large enough to contain a rectangular area measuring at least 1½ by 2 inches, which must split easily and evenly and be nearly free from "cracks," "rulings," "markings," and all fracture lines and reasonably free from inclusions or specks of foreign mineral matter. The size stated is the smallest rectangular size that is salable in the form of uncut sheet; the irregularly bounded rough-trimmed mica sheet must be nearly twice as large to yield this size—in other words, a sheet that would yield a suitable rectangle 1½ by 2 inches and would be classed as "1½ by 2 inches" would have to measure nearly 3 by 4 inches.

Splittings are the thin films or flakes of mica that are split from the smaller sheet or waste material. They are about one-thousandth of an inch thick and are irregular in shape.

Material suitable as scrap mica for grinding must be free from all foreign matter, especially gritty material such as quartz and feldspar.

The system of classification of mica, by sizes, is different in the United States, Canada, and India. The United States classification is as follows (figures represent inches): Punch, circle, 1½ by 2, 2 by 2, 2 by 3, 3 by 4, 3 by 5, 4 by 6, 6 by 6, 6 by 8, 8 by 10, and larger. For punch mica the uncut sheet must be of sufficient size to yield a circle 1½ inches in diameter if stained and 1¼ inches if clear; circle mica should yield a disk nearly 2 inches in diameter.

Canadian or "amber" mica is also classified on the basis of the size of the rectangle obtainable, but the sizes differ from those used for the United States mica. The sizes used for Canadian mica, in inches, are 1 by 1, 1 by 2, 1 by 3, 2 by 3, 2 by 4, 3 by 5, 4 by 6, and 5 by 8.

The Indian classification is not based on the size of the rectangle obtainable but on the area of usable mica in the sheet. The following table shows the Indian system of grading, with the approximate corresponding sizes used in the United States classification:

Grading of Indian mica

Grade	Area of usable mica (in square inches), based on rectangular sizes	Sizes of rectangles that can be cut (in inches)				Approximate corresponding sizes in United States classification (in inches)
		Width		Length		
		Minimum	Maximum	Minimum	Maximum	
6	Less than 3					Punch.
5	3 to 5⅞	1	2	2	2½	2 by 2.
4	6 to 9⅞	1½	2½	2½	3	2 by 3. 3 by 3.
3	10 to 14⅞	1½	3	3	4½	3 by 4.
2	15 to 23⅞	1½	3½	4½	6	3 by 5.
1	24 to 35⅞	3	5	5	7	4 by 6.
A-1	36 to 47⅞	4	6	7	9	5 by 8.
Special	48 to 59⅞					6 by 8.
Extra special	60 to 71⅞					8 by 8.
Extra extra special	72 and more					8 by 10.

CONSUMPTION OF MICA SPLITTINGS

The consumption of mica splittings in the United States in 1927, as reported by consumers, was as follows: Indian splittings, 1,917,627 pounds, valued at $1,158,675; Canadian splittings, 151,324 pounds, valued at $122,689; and Madagascan splittings, 183,558 pounds, valued at $162,160. These figures may not fully represent consumption, as it is possible that some domestic and South American splittings were used by consumers who have not responded fully to the inquiries made of them.

PRICES

In 1927 the range of prices per pound for rough-trimmed uncut sheet mica, as reported to the Bureau of Mines by producers and others engaged in the industry, were as follows:

Range of prices per pound for rough-trimmed uncut sheet mica in 1927

Size	Clear	Stained	Size	Clear	Stained
Punch	$0.05–$0.15	$0.04–$0.13	3 by 4 inches	$1.20–$2.20	$0.85–$1.50
1½ by 2 inches	.25– .35	.20– .25	3 by 5 inches	1.75– 2.64	1.10– 1.75
2 by 2 inches	.40– .85	.15– .35	4 by 6 inches	2.00– 3.50	1.50– 2.00
2 by 3 inches	.67– 1.50	.30– .60	6 by 8 inches	3.75– 5.00	1.75– 4.25
3 by 3 inches	1.00– 2.15	.60– 1.30	8 by 10 inches	7.00– 8.00	2.50– 3.00

Prices of scrap mica a short ton ranged from $14 to $25 at the mines

MATERIALS ALLIED TO MICA

The materials allied to mica by similar constitution, physical characteristics, and uses include the following: (1) Vermiculite, (2) clinochlore ("chlorite schist"), (3) muscovite mica schist, and (4) biotite mica schist.

1. The term "vermiculite" is applied to a form of altered biotite and phlogopite mica, the alteration being accompanied by the oxidation of the iron and the introduction of considerable water. The

variety of altered biotite to which the name vermiculite was originally applied exfoliates greatly on being heated, some varieties slowly exfoliating into wormlike threads, which gave the name vermiculite to the group. The material is said to be suitable for insulation or filtration purposes, for use in the manufacture of wall paper, roofing materials, and in other ways.

A deposit of this material in Custer County, Colo., near Westcliffe, owned by the Jefferisite Products Co., 902 Patterson Building, Denver, was reported a few years ago by the company to be under development, but no commercial production has been reported by the company to the Bureau of Mines. In 1927 D. E. C. Austin, of Turret, Colo., reported a small production of vermiculite from the Inspiration mine, about 5 miles southeast of Hecla, Chaffee County, Colo. The deposit of similar altered mica near Libby, Mont., is being developed by the Zonolite Co., of Spokane, Wash. The product, after being heated, is called "zonolite" and is sold to oil, cork, electrical, pipe and boiler covering, refrigerator, millboard, safe, roofing, bake oven, and wall plaster companies. The company has reported a small production in each of the last three years.

2. Chlorite schist, consisting chiefly of the mineral clinochlore, has been mined and sold for many years at Canton, Cherokee County, Ga., by the American Mica Co., 7 Hanover Street, New York City. Clinochlore occurs as crystals with a cleavage like mica, the cleavage plates, however, being only slightly elastic; it is also found in compact masses made up of fine scales. It is used in the same manner as ground mica; that is, it is ground to various meshes and used chiefly in the manufacture of roofing materials and to some extent in the manufacture of hard rubber goods, automobile tires, foundry facing, and lubricants. The American Mica Co. reported in 1927 that it had discontinued operations at Canton, but it named no successor. In 1927 Thompson, Weinman & Co., of Cartersville, Ga., reported a production of chlorite schist from property at Canton. The company states that the material is ground at Cartersville and sold to manufacturers of rubber goods.

3. For several years muscovite mica schist has been mined by the Nassau Producing Corporation, of Spruce Pine, N. C., from properties in various sections of Mitchell County, N. C. All of the product is sold to the roofing trade.

4. The Roofing Mica Co., of Spruce Pine, N. C., made sales of mica schist (biotite) from property in Mitchell County, N. C. The material was ground by the company and sold to a New York consumer.

IMPORTS AND EXPORTS

Mica imported for consumption in 1927 included unmanufactured, cut (dimension sheets), splittings, built-up mica boards, cups, tubes, and mica plates, washers, and other manufactures. The imports of uncut sheet mica in 1927, exclusive of the Madras square-shaped uncut sheets, were 776,307 pounds, valued at $399,302, a decrease of 5 per cent in quantity and 29 per cent in value as compared with 1926. No imports of ground mica were recorded for 1927. Imports of cut mica (dimension sheets) increased 37 per cent in quantity and 69 per cent in value. Imports of mica splittings, which constituted 75 per cent of the total quantity of mica imported in 1927 were 51 per cent less in quantity and 36 per cent less in value than in 1926. Imports of built-up mica boards, etc., decreased 47 per cent in quantity and 40 per cent in value; imports of washers decreased 63 per cent in quantity and 69 per cent in value as compared with 1926.

Mica imported for consumption in the United States, 1922–1927

Kind	1922		1923		1924	
	Pounds	Value	Pounds	Value	Pounds	Value
Unmanufactured [1]	385, 653	$359, 793	1, 044, 366	$532, 375	671, 793	$419, 154
Cut and split [2]	(3)	[4] 555, 243	(4)	(4)	(4)	(4)
Ground	313, 745	4, 514	1, 867, 385	28, 324	1, 342, 107	22, 034
Cut mica (dimension sheets)	[5] 42, 579	[5] 18, 372	60, 135	49, 268	74, 534	69, 018
Splitting	[5] 1, 063, 306	[5] 371, 801	4, 301, 727	1, 730, 532	3, 619, 229	1, 681, 774
Built-up mica boards, cups, tubes, and mica plates	[5] 1, 807	[5] 2, 860	30, 032	37, 382	18, 205	41, 455
Washers	[5] 2, 562	[5] 675	20, 164	6, 776	18, 517	5, 325
Other manufactures	[5] 7, 842	[5] 17, 364	7, 044	20, 191	56, 766	88, 146
	-----------	1, 330, 622	7, 330, 853	2, 404, 848	5, 801, 151	2, 326, 906

Kind	1925		1926		1927	
	Pounds	Value	Pounds	Value	Pounds	Value
Unmanufactured [1]	604, 550	$526, 292	818, 381	$562, 300	776, 307	$399, 302
Ground	950, 614	13, 120	140, 732	2, 048	-----------	-----------
Cut mica (dimension sheets)	41, 284	63, 466	46, 662	44, 621	64, 075	75, 469
Splittings	3, 239, 554	1, 113, 202	5, 229, 858	1, 750, 434	2, 588, 253	1, 123, 808
Built-up mica boards, cups, tubes, and mica plates	14, 639	16, 785	15, 147	15, 410	8, 097	9, 211
Washers	222	50	4, 620	1, 723	1, 732	536
Other manufactures	50, 445	65, 912	62, 696	74, 298	21, 183	21, 983
	4, 901, 308	1, 798, 827	6, 318, 096	2, 450, 834	3, 459, 647	1, 630, 309

[1] Essentially uncut trimmed sheets.
[2] Includes the Madras square-shaped uncut sheets.
[3] Quantity not recorded prior to change in tariff, Sept. 22, 1922.
[4] Classification discontinued with change in tariff and items shown separately.
[5] Sept. 22–Dec. 31. Not separately classified prior to change in tariff.

The import duty on mica as fixed by the tariff act of September 22, 1922, paragraph 208, is as follows:

> Mica, unmanufactured, valued at not above 15 cents per pound, 4 cents per pound, valued above 15 cents per pound, 25 per cent ad valorem; mica, cut or trimmed, and mica splittings, 30 per cent ad valorem; mica plates and built-up mica and all manufactures of mica or of which mica is the component material of chief value, 40 per cent ad valorem; ground mica, 20 per cent ad valorem.

The following table showing mica imported (general imports) into the United States by kinds and by countries, indicates that imports from India formed 62 per cent of the total. Mica from India is uncut sheet and splittings, but the proportions are not known. Although Madras square-trimmed mica is termed "cut mica" in import schedules, in reality it is uncut trimmed mica. Canada was the second largest shipper to the United States and furnished 18 per cent of the total imports. Mica from Canada is almost entirely phlogopite, and that from India is muscovite. Eighty per cent of the mica imported into the United States in 1927 came from these two countries.

Mica imported into the United States in 1927, by kinds and by countries

[General imports]

Country	Crude or unmanufactured				Cut mica, dimension sheets (duty 30 per cent)		Mica splittings (duty 30 per cent)	
	Valued at not above 15 cents per pound (duty 4 cents per pound)		Valued at above 15 cents per pound (duty 25 per cent)					
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Africa, Union of South	1, 413	$109	3, 288	$1, 582				
Argentina	12, 906	1, 933	47, 960	26, 073				
Austria								
Brazil			15, 571	11, 693			619	$523
Canada	168, 914	18, 296	167, 232	36, 441	36, 821	$25, 147	223, 699	147, 853
Chile			2, 800	2, 042				
Czechoslovakia			5, 952	4, 054				
France	447	617	25, 651	17, 411	9, 308	19, 202	212, 477	115, 017
Germany	5, 000	700	4, 607	2, 733	2, 716	5, 799		
Guatemala			5, 233	3, 824	4, 200	2, 861	2, 763	992
India, British	5, 240	529	205, 262	198, 617	2, 805	2, 297	1, 810, 445	652, 275
Madagascar			10, 258	2, 991			29, 028	10, 576
Mozambique	2, 126	220	2, 939	1, 170				
Newfoundland and Labrador	75	5						
United Kingdom	440	25	63, 824	61, 674	7, 343	11, 234	156, 527	68, 609
	196, 561	22, 434	560, 577	370, 305	63, 193	66, 540	2, 435, 558	995, 845

Country	Built-up mica products, boards, cups, tubes, and mica plates (duty 40 per cent)		Washers (duty 40 per cent)		Other manufactures, not specially provided for (duty 40 per cent)		Total	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Africa, Union of South							4, 701	$1, 691
Argentina							60, 866	28, 006
Austria					7	$10	7	10
Brazil							16, 190	12, 216
Canada			27	$18			596, 693	227, 755
Chile							2, 800	2, 042
Czechoslovakia							5, 952	4, 054
France					1, 538	3, 491	249, 421	155, 738
Germany	2, 325	$2, 513			5, 280	6, 415	19, 928	18, 160
Guatemala			1, 471	456	149	92	13, 816	8, 225
India, British	100	366	1, 800	1, 260	17, 742	13, 293	2, 043, 394	868, 637
Madagascar							39, 286	13, 567
Mozambique	149	59			439	191	5, 653	1, 640
Newfoundland and Labrador							75	5
United Kingdom	50	61			2, 425	767	230, 609	142, 370
	2, 624	2, 999	3, 298	1, 734	27, 580	24, 259	3, 289, 391	1, 484, 116

Mica and manufactures of mica exported in 1927 amounted to 2,867,798 pounds, valued at $207,263, compared with 2,326,131 pounds, valued at $230,511, in 1926. As the classes of mica are not shown in export schedules, it is not possible to state what kinds of mica are exported.

WORLD PRODUCTION

World's production of mica, 1923-1927, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
North America:					
Canada	3, 197	3, 711	3, 647	2, 309	2, 484
Guatemala	(1)	(1)	16	12	7
United States	8, 243	4, 934	9, 609	7, 374	6, 383
South America:					
Argentina [2]	87	120	119	84	(1)
Brazil [2]	56	79	65	52	39
Europe:					
Norway [2]	10	25	23	42	(1)
Rumania	6				
Russia [3]	(1)	(1)	18	64	(1)
Spain	3				
Sweden	5	4	95	53	10
Asia:					
Ceylon [2]	1		1		
Chosen	11	23	20	16	(1)
India, British [4]	4, 232	3, 561	5, 065	4, 569	3, 937
Japan	431	592	1, 082	(1)	(1)
Russia [3]	(1)	(1)	175	421	(1)
Africa:					
Madagascar [2]	165	286	267	296	544
Rhodesia—					
Northern				4	8
Southern	83	136	132	166	186
Tanganyika Territory [2]	33	58	53	54	44
Union of South Africa (Transvaal)	14	735	1, 462	872	1, 454
Oceania:					
Australia—					
Northern Territory	3	3	3	3	[5] 4
Queensland			1		1
Western Australia [2]				4	4

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[1] Data not available.

[2] Exports.

[3] Year ended Sept. 30.

[4] Exports. The figures for output are incomplete, and a more accurate idea of the size of the industry is to be obtained from the export figures. (Rec. Geol. Surv. of India, vol. 59, pt. 3, p. 273. Calcutta, 1926.) Output is reported as follows: 1923, 1,720 tons; 1924, 2,078 tons; 1925, 2,336 tons; 1926, 2,130 tons; 1927, 2,165 tons.

[5] Produced in Central Australia, one of the two Provinces into which the Northern Territory was divided in 1927.

NATURAL GASOLINE

By G. R. Hopkins[1]

The natural-gasoline industry continued to grow unabated in 1927, when the total output amounted to 1,641,144,000 gallons, or 39,075,000 barrels. This huge quantity represents an increase of 20 per cent over 1926, as compared with an annual increase of 21 per cent in both 1926 and 1925. As an added illustration of the rapid growth of the natural-gasoline industry, it may be cited that the 1927 production was more than double that of 1923. Approximately one-half of the gain in output in 1927 over 1926 was due to the increase in the quantity of natural gas treated; the remainder was due to the increase in recovery which, in turn, was due both to greater efficiency in operation and to richer gas. The preliminary figure for the total production of natural gasoline in 1927, as compiled from replies to monthly inquiries and as shown on page 207 of this report, was 1,623,600,000 gallons, the difference between the two totals being due to the fact that the annual canvass reaches a few small plants not covered by the monthly inquiries.

All of the States, with the exception of New York, Pennsylvania, Kentucky, and Illinois, reported gains in output over 1926. Oklahoma was again the leading producing State, followed by California and Texas. These three States produced 83 per cent of the total output in 1927, as compared with 81 per cent in 1926. The decline in natural-gasoline production in Pennsylvania resulted from the usual cause—a declining gas supply—but the major factor in the decreased output of New York, Kentucky, and Illinois was a drop in the recovery.

Los Angeles County, Calif., was again the leading producing county in the country, with an output of nearly 249,000,000 gallons, or 15 per cent of the total production. Seminole County, Okla., ranked second, with an output of approximately 164,000,000 gallons, or more than double that of 1926; this increase was due both to the placing in operation of a number of large plants and to the richer natural gas treated. Other important producing counties were Osage and Creek Counties, Okla., Orange, Ventura, and Kern Counties, Calif., and Eastland, Hutchinson, and Stephens Counties, Tex. The production of Hutchinson County, Tex., increased from approximately 10,000,000 gallons in 1926 to nearly 65,000,000 gallons in 1927; this was the most noteworthy increase in any important producing county.

Of the total output in 1927, 1,209,000,000 gallons, or 74 per cent, was reported as blended at refineries; 153,000,000 gallons, or 9 per cent, was turned into pipe lines and run to stills; 35,000,000 gallons, or 2 per cent, was blended at the plants; about 10,000,000 gallons was blended by jobbers; and 13,000,000 gallons was added to storage, leaving 221,144,000 gallons, or 14 per cent, for losses and quantities not accounted for.

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[1] Figures compiled by E. M. Seeley, of the Bureau of Mines.

Although the quantity of natural gasoline used by refiners in 1927 showed a 16 per cent increase over 1926 the percentage of the total output so used fell from 86 to 83; in other words, the increase in use of natural gasoline at refineries, while large, was less than the increase in output of natural gasoline. The increase in production of motor fuel at refineries in 1927 was only 10 per cent; this fact, in connection with the 16 per cent gain in use of natural gasoline by refiners, would indicate a higher proportion of natural gasoline in the average gallon of motor fuel in 1927 than in 1926. That this was the case seems proved by the fact that an analysis of motor-fuel production by method of manufacture shows that 9.7 per cent of the total output in 1927 resulted from the use of natural gasoline as compared with 9.2 per cent in 1926. The extreme price decline of 1927 to below the average cost of production was in sympathy with the drop in price of motor fuel, but it is also an indication that the saturation point in use at refineries has been nearly reached, and that new markets for natural gasoline must be developed. Accordingly, efforts are being made to increase the use of natural gasoline in foreign countries, in airplanes, and in the manufacture of special fuels and products.

The quantity of natural gasoline transported to refineries by means of pipe lines was nearly 153,000,000 gallons in 1927, a slight increase over 1926. Of this amount approximately 142,000,000 gallons, or 93 per cent, was handled by pipe lines in California.

The record-breaking output of crude petroleum in 1927 entailed the construction of many new natural-gasoline plants to treat the natural gas produced with the flush production of petroleum. Consequently, both the number of natural-gasoline producers and the number of plants increased over 1926. California reported a decrease from 172 to 152 in number of plants, but this decrease was more than compensated by the new plants erected in the Mid-Continent field.

A further decrease in the number of compression plants and another increase in the number of absorption plants took place in 1927; the number of charcoal plants was unchanged at 30. In 1927 compression plants produced 241,799,000 gallons, or 15 per cent of the total; absorption and combination processes, 1,377,122,000 gallons, or 84 per cent; and charcoal plants 22,223,000 gallons, or 1 per cent. These figures indicate a material gain in 1927 in the proportion manufactured by absorption and combination processes.

The yield of natural gasoline per thousand cubic feet of gas treated for the country as a whole amounted to 1.2 gallons in 1927, a gain of 0.1 gallon over 1926. This increase, while apparently small, was very important, as it was responsible for approximately one-half of the gain in total output. The average yield in the leading producing State, Oklahoma, also increased 0.1 gallon in 1927; a large part of this increase resulted from developments in the Seminole district, where the natural-gasoline plants made an average recovery of 2.3 gallons in 1927, a figure which will probably be surpassed in 1928 when the gas pressure of the fields will be lower. The average yield in California also increased 0.1 gallon as a result of the increasing richness of the natural gas in the older Los Angeles basin fields and of the high yield obtained at Seal Beach and Ventura.

The value at the plants of the total output in 1927 was $118,688,000, an average of 7.2 cents per gallon, as compared with an average of 10 cents in 1926. From point of value, the record of the natural-gasoline industry in 1927 was similar to the petroleum industry, with a much increased output but a lower total value. The average spot price per gallon for Oklahoma natural gasoline, grade A, in 1927 was 5.84 cents, as compared with 9.58 cents in 1926. The considerable difference between the average spot price and the average value at plants in 1927 was probably due to the continuation of contracts into 1927 at 1926 prices. Spot prices were at their highest at the beginning of the year but during the spring months dropped off to below 5 cents per gallon. Some slight recovery was evidenced later in the year, but as 1927 closed there was considerable room for improvement.

Natural gasoline produced in the United States, 1926 and 1927, by States

State	Number of operators reporting [1]	Number of plants	Raw (unblended) gasoline produced			Estimated quantity of natural gas treated	
			Thousands of gallons	Value at plant		Millions of cubic feet	Average yield per M cubic feet (gallons)
				Thousands of dollars	Average per gallon (cents)		
1926							
Alaska	1	1	33	4	12.1	25	1.3
Arkansas	10	16	30,385	2,867	9.4	20,903	1.5
California	65	172	389,366	[2] 45,945	11.8	284,365	1.4
Colorado	1	3	276	17	6.2	90	.7
Illinois	26	82	9,987	967	9.7	3,674	2.7
Kansas	14	21	25,369	2,105	8.3	30,801	.8
Kentucky	10	12	7,689	914	11.9	26,521	.3
Louisiana	26	44	43,557	3,692	8.5	111,537	.4
New Mexico	1	1	1,488	146	9.8	884	1.7
New York	4	4	539	66	12.2	500	1.1
Ohio	21	40	10,817	1,402	13.0	45,533	.2
Oklahoma	94	297	475,716	41,433	8.7	235,157	2.0
Pennsylvania	90	141	20,343	2,454	12.1	63,819	.3
Texas	50	134	243,093	22,760	9.4	181,243	1.3
West Virginia	44	123	63,807	7,706	12.1	166,135	.4
Wyoming	8	11	40,625	3,934	9.7	34,813	1.2
	[1] 390	1,102	1,363,090	136,412	10.0	1,206,300	1.1
1927							
Alaska	1	1	19	2	10.5	15	1.3
Arkansas	12	16	37,498	2,281	6.1	20,566	1.8
California	50	152	498,020	52,436	10.5	332,676	1.5
Colorado	2	2	912	64	7.0	1,455	.6
Illinois	27	83	8,853	532	6.0	3,582	2.5
Kansas	15	25	36,095	1,746	4.8	28,906	1.2
Kentucky	10	12	7,480	547	7.3	27,994	.3
Louisiana	29	49	44,844	2,442	5.4	118,191	.4
New Mexico	1	1	1,827	109	6.0	998	1.8
New York	3	3	449	38	8.5	539	.8
Ohio	21	39	12,167	1,062	8.7	42,623	.3
Oklahoma	98	302	548,109	29,114	5.3	262,703	2.1
Pennsylvania	98	147	16,744	1,648	9.8	47,424	.4
Texas	57	152	320,723	18,347	5.7	265,699	1.2
West Virginia	44	125	64,192	5,421	8.4	152,297	.4
Wyoming	8	10	43,212	2,899	6.7	35,580	1.2
	[1] 394	1,119	1,641,144	118,688	7.2	1,341,248	1.2

[1] A producer operating in more than 1 State is counted only once.

[2] Estimated.

Natural gasoline produced in the United States, 1926 and 1927, by States and by methods of manufacture

State	Number of plants			Raw (unblended) gasoline produced (thousands of gallons)		
	Compression	Absorption including combination absorption process with compression and charcoal processes	Charcoal	Compression	Absorption including combination absorption process with compression and charcoal processes	Charcoal
1926						
Alaska		1			33	
Arkansas	2	13	1	(1)	[1]29,426	959
California	6	161	5	5,801	381,769	1,796
Colorado	1	2		16	260	
Illinois	82			9,987		
Kansas	6	15		4,807	20,562	
Kentucky	4	5	3	640	5,961	1,088
Louisiana	11	31	2	7,662	35,316	579
New Mexico		1			1,488	
New York	2	2		(1)	[1]539	
Ohio	22	16	2	715	8,453	1,649
Oklahoma	134	163		115,780	359,936	
Pennsylvania	111	26	4	6,718	11,059	2,566
Texas	42	90	2	51,734	191,022	337
West Virginia	66	46	11	10,757	41,909	11,141
Wyoming	4	7		27,950	12,675	
	493	579	30	243,084	1,099,891	20,115
1927						
Alaska		1			19	
Arkansas	3	12	1	2,646	33,353	1,499
California	4	147	1	4,718	492,489	813
Colorado		2			912	
Illinois	83			8,853		
Kansas	7	18		7,281	28,814	
Kentucky	4	5	3	1,228	5,269	983
Louisiana	11	35	3	8,135	35,734	975
New Mexico		1			1,827	
New York	1	2		132	317	
Ohio	22	15	2	600	9,805	1,762
Oklahoma	126	175	1	111,621	436,072	416
Pennsylvania	119	24	4	6,061	9,073	1,610
Texas	42	107	3	48,782	270,170	1,771
West Virginia	65	48	12	11,468	40,330	12,394
Wyoming	3	7		30,274	12,938	
	490	599	30	241,799	1,377,122	22,223

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[1] Compression included under combination processes in order to avoid disclosing the production of individual operators.

Natural gasoline produced in the United States in 1927, by States and by counties

State	County	Thousands of gallons	Thousands of dollars
Alaska	Third division	19	2
Arkansas	Ouachita	11,221	668
	Union	26,277	1,613
		37,498	2,281
California	Fresno and Riverside	1,445	150
	Kern	70,789	8,265
	Los Angeles	248,725	25,743
	Orange	100,088	10,755
	Santa Barbara	5,963	558
	Ventura	71,010	6,965
		498,020	52,436

Natural gasoline produced in the United States in 1927, by States and by counties—Continued

State	County	Thousands of gallons	Thousands of dollars
Colorado	Larimer and Las Animas	912	64
Illinois	Clark	64	4
	Crawford	2,442	149
	Cumberland	559	33
	Lawrence	5,788	346
		8,853	532
Kansas	Butler	7,557	401
	Chautauqua	471	23
	Cowley	6,770	353
	Greenwood	12,101	553
	Montgomery, Sumner, and Wilson	9,196	416
		36,095	1,746
Kentucky	Boyd and Clark	3,920	287
	Estill, Floyd, and Martin	1,256	101
	Johnson, Menifee, and Wayne	381	28
	Lee	1,923	131
		7,480	547
Louisiana	Caddo	9,838	600
	Claiborne	14,306	839
	De Soto, Red River, and Webster	5,570	317
	Morehouse	3,230	150
	Ouachita	11,900	536
		44,844	2,442
New Mexico	Eddy	1,827	109
New York	Allegany	449	38
Ohio	Athens, Cuyahoga, and Fairfield	2,074	187
	Hocking and Meigs	262	23
	Jefferson and Wayne	1,463	125
	Knox, Lorain, and Medina	585	46
	Licking	3,478	312
	Monroe	404	38
	Muskingum, Noble, and Richland	3,359	285
	Washington	542	46
		12,167	1,062
Oklahoma	Carter	14,525	881
	Creek	87,187	4,580
	Garfield	23,757	1,229
	Grady and Rogers	1,826	91
	Grant, Harmon, and Logan	2,841	142
	Hughes	11,003	656
	Kay	43,900	2,214
	Lincoln	15,946	923
	Muskogee	1,331	72
	Noble	24,102	1,036
	Nowata	4,425	226
	Okfuskee	8,071	447
	Okmulgee	13,892	734
	Osage	97,238	5,397
	Pawnee	8,598	512
	Payne	7,038	452
	Pottawatomie, Stephens, and Wagoner	8,315	420
	Seminole	164,447	8,580
	Tulsa	5,925	312
	Washington	3,742	210
		548,109	29,114
Pennsylvania	Allegheny	2,204	202
	Armstrong and Beaver	130	13
	Butler	661	64
	Clarion	425	46
	Crawford	439	37
	Elk, Lawrence, and Potter	326	31
	Forest	838	68
	Greene	4,391	412
	McKean	1,442	147
	Venango	2,279	249
	Warren	2,381	224
	Washington	1,228	155
		16,744	1,648

Natural gasoline produced in the United States in 1927, by States and by counties—Continued

State	County	Thousands of gallons	Thousands of dollars
Texas	Archer	3,488	216
	Brown	10,165	538
	Carson	11,787	823
	Clay and Coleman	3,580	191
	Cooke and Erath	2,947	189
	Eastland	64,990	3, 909
	Freestone, Howard, and Limestone	1,453	102
	Gray	9,452	703
	Hutchinson	64,859	3, 631
	Mitchell and Navarro	7,583	430
	Palo Pinto	4,190	185
	Panola, Potter, and Reagan	8,011	369
	Shackelford	11,754	676
	Stephens	62,984	3,487
	Throckmorton, Webb, and Wheeler	3,296	172
	Wichita	36,726	1,980
	Wilbarger and Williamson	4,934	236
	Young	8,524	510
		320,723	18,347
West Virginia	Boone and Brooke	191	16
	Cabell and Calhoun	2,335	205
	Clay and Doddridge	365	29
	Gilmer, Jackson, and Lincoln	6,608	534
	Harrison	2,275	187
	Kanawha	23,978	1,977
	Lewis	5,361	489
	Marion	3,428	294
	Marshall, Wayne, and Wirt	1,043	86
	Monongalia	944	72
	Pleasants	777	74
	Ritchie	569	44
	Roane	2,759	223
	Tyler	2,582	215
	Wetzel	10,977	976
		64,192	5,421
Wyoming	Carbon, Fremont, Hot Springs, and Niobrara	3,880	269
	Natrona	39,332	2,630
		43,212	2,899
United States		1,641,144	118,688

Stocks at natural gasoline plants, January 1 and December 31, 1927, in thousands of gallons

State	Raw natural gasoline		Blended gasoline	
	Jan. 1	Dec. 31	Jan. 1	Dec. 31
Alaska			10	8
Arkansas	326	296	13	30
California	1, 417	1, 449	7	9
Colorado	51	34		
Illinois	174	217		
Kansas	409	723	3	12
Kentucky	103	122	10	17
Louisiana	925	898		
New Mexico	41	48		
New York	25	27	13	46
Ohio	296	750		9
Oklahoma	8, 080	15, 911	1, 046	807
Pennsylvania	1, 082	1, 100	171	139
Texas	4, 820	8, 815	54	131
West Virginia	1, 467	1, 426	102	36
Wyoming	229	410	33	88
	19, 445	32, 226	1, 462	1, 332

Natural gasoline turned into crude petroleum pipe lines in the United States, 1923–1927, by States, in thousands of gallons

State	1923	1924	1925	1926	1927
Alaska			20	18	15
Arkansas				[1] 2,188	
California	50,398	87,135	107,771	138,474	141,500
Illinois	26			12	3
Kansas				243	3,172
Kentucky				1	
Louisiana	3,049	373	136		72
Oklahoma	15,418	1,640	2,065	8,472	5,701
Pennsylvania	252				
Texas	3,529	347	171	91	1,658
West Virginia	25				10
Wyoming	1,838			47	548
	74,535	89,495	110,163	[1] 149,546	152,679

[1] Revised figures.

Natural gasoline produced in the United States, 1918–1927, by States, in thousands of gallons

Year	Arkansas	California	Colorado	Illinois	Kansas	Kentucky	Louisiana	New Mexico	New York
1918		32,269	2	4,575	2,390	3,331	7,021		218
1919		40,386		6,060	3,284	5,136	10,063		458
1920		48,208		6,055	4,331	4,497	10,610		411
1921		58,220		7,536	3,587	4,242	15,341		366
1922	4,289	67,120		7,760	2,856	5,205	29,406		506
1923	16,183	173,329		7,356	8,775	7,601	40,720		408
1924	17,533	232,579		9,091	11,658	7,274	48,098		477
1925	19,686	303,180	35	9,874	19,592	7,685	43,489		414
1926	30,385	389,366	276	9,987	25,369	7,689	43,557	1,488	539
1927	37,498	498,020	912	8,853	36,095	7,480	44,844	1,827	449

Year	Ohio	Oklahoma	Pennsylvania	Texas	West Virginia	Wyoming	Alaska	Total		
								Thousands of gallons	Value at plant	
									Thousands of dollars	Average per gallon (cents)
1918	6,745	163,701	15,775	7,326	37,604	1,579		282,536	50,364	17.8
1919	8,801	189,995	20,284	9,337	52,150	5,581		351,535	64,197	18.3
1920	10,016	178,857	21,151	32,956	58,941	8,711		384,744	71,788	18.7
1921	9,100	185,341	19,856	77,141	54,646	14,558		449,934	61,815	13.7
1922	8,600	189,404	18,518	95,405	56,796	19,967		505,832	72,711	14.4
1923	10,035	270,249	19,132	177,765	63,381	21,292		816,226	77,268	9.5
1924	9,443	301,062	19,254	186,571	61,549	29,272		933,861	82,233	8.8
1925	8,701	390,861	18,850	214,092	58,201	32,777	33	1,127,470	120,383	10.7
1926	10,817	475,716	20,343	243,093	63,807	40,625	33	1,363,090	136,412	10.0
1927	12,167	548,109	16,744	320,723	64,192	43,212	19	1,641,144	118,688	7.2

Natural gas produced and consumed in the United States and portion treated for recovery of natural gasoline, 1918–1927

	Produced and delivered to consumers (millions of cubic feet)	Consumed (millions of cubic feet)	Treated for recovery of gasoline (millions of cubic feet)	Ratio (percentage) of natural gas treated for gasoline	
				To quantity produced and delivered to consumers	To quantity consumed
1918	721, 001		449, 109	62	
1919	745, 916		480, 404	64	
1920	798, 210		496, 431	62	
1921	662, 052		465, 097	70	
1922	762, 546		545, 139	71	
1923	[1] 1, 006, 976	1, 006, 967	875, 711	87	87
1924	[2] 1, 141, 521	1, 141, 482	1, 016, 276	89	89
1925	[3] 1, 188, 571	1, 188, 439	1, 040, 390	88	88
1926	[4] 1, 313, 019	1, 312, 853	1, 206, 300	92	92
1927:					
Arkansas	30, 450	40, 916	20, 566	68	50
California [5]	212, 364	212, 364	332, 676	157	157
Colorado	1, 725	1, 544	1, 455	84	94
Illinois	3, 741	3, 741	3, 582	96	96
Kansas	42, 646	66, 618	28, 906	68	43
Kentucky [6]	10, 206	16, 694	27, 994	274	168
Louisiana	186, 961	170, 310	118, 191	63	69
New Mexico	1, 019	1, 019	998	98	98
New York	[7] 5, 908	16, 175	539	9	3
Ohio	51, 381	112, 603	42, 623	83	38
Oklahoma	326, 864	286, 485	262, 703	80	92
Pennsylvania	105, 710	121, 982	47, 424	45	39
Texas [5] [6]	[8] 254, 063	269, 944	265, 699	105	98
West Virginia [9]	162, 375	66, 200	152, 297	94	230
Wyoming	43, 582	42, 559	35, 580	82	84
Other	6, 433	16, 090	15		
	[10] 1, 445, 428	1, 445, 244	1, 341, 248	93	93

[1] Includes 9,000,000 cubic feet piped to Mexico.

[2] Includes 39,000,000 cubic feet piped to Canada and Mexico.

[3] Includes 132,000,000 cubic feet piped to Canada and Mexico.

[4] Includes 166,000,000 cubic feet piped to Canada and Mexico.

[5] Large quantities of gas both before and after the recovery of gasoline were blown in the air or unaccounted for.

[6] Quantities of natural gas were piped from other States, treated for gasoline recovery, and residue gas returned to State in which produced.

[7] Includes 71,000,000 cubic feet piped to Canada.

[8] Includes 113,000,000 cubic feet piped to Mexico.

[9] Natural gas was treated for gasoline recovery and consumed in other States.

[10] Includes 184,000,000 cubic feet piped to Canada and Mexico.

Summary of monthly (preliminary) natural gasoline and motor-fuel statistics in the United States in 1927, in millions of gallons

	January	February	March	April	May	June	July	August	September	October	November	December	The year
Natural gasoline (raw):													
Production by fields—													
Appalachian	11.2	9.9	9.6	8.3	7.2	5.8	5.4	5.7	5.6	7.4	8.3	10.0	94.4
Kentucky and Illinois	1.7	1.5	1.5	1.4	1.2	1.1	1.1	1.2	1.2	1.4	1.4	1.3	16.0
Oklahoma and Kansas	43.6	41.7	45.6	45.3	47.7	47.2	48.2	48.7	50.5	53.0	53.0	54.0	578.5
Texas	24.7	23.9	28.4	26.4	26.7	25.4	25.5	27.2	26.3	27.6	27.5	27.0	316.6
Louisiana and Arkansas	6.9	6.4	7.0	7.0	7.3	6.8	7.0	7.3	6.4	6.9	6.7	6.8	82.5
Rocky Mountain	3.7	3.5	4.0	4.0	4.1	4.2	4.1	3.9	3.9	3.8	3.9	2.8	45.9
Total east of California	91.8	86.9	96.1	92.4	94.2	90.5	91.3	94.0	93.9	100.1	100.8	101.9	1,133.9
California	40.3	36.3	41.3	40.8	41.0	39.4	39.7	41.0	42.4	43.5	41.7	42.3	489.7
Total United States	132.1	123.2	137.4	133.2	135.2	129.9	131.0	135.0	136.3	143.6	142.5	144.2	1,623.6
Daily average	4.3	4.4	4.4	4.4	4.4	4.3	4.2	4.4	4.5	4.6	4.8	4.7	4.4
Indicated deliveries	127.7	120.7	134.1	129.4	129.4	128.0	130.1	141.2	140.9	141.7	140.9	147.8	1,611.9
Stocks at end of period	23.5	26.0	29.3	33.1	38.9	40.8	41.7	35.5	30.9	32.8	34.4	30.8	30.8
Blending at plants:													
Raw gasoline used [1]	2.6	2.3	2.5	3.1	3.2	3.3	3.2	3.2	2.6	3.1	2.7	2.8	34.6
Naphtha used [1]	4.0	3.8	4.6	4.8	4.8	4.8	5.6	4.9	4.4	3.9	3.9	3.9	53.4
Stocks of blends at end of period	1.4	1.6	1.4	1.9	1.9	1.8	1.5	1.6	1.2	1.2	1.3	1.4	1.4
Indicated output of motor fuel:													
Gasoline produced at refineries	1,174.3	1,051.0	1,171.2	1,116.2	1,125.1	1,117.9	1,181.0	1,176.4	1,164.1	1,213.9	1,199.4	1,197.5	13,888.0
Natural gasoline—													
Blended at plants [1]	2.6	2.3	2.5	3.1	3.2	3.3	3.2	3.2	2.6	3.1	2.7	2.8	34.6
Sold to jobbers (estimate)	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	9.6
Benzol produced [2]	9.1	8.4	9.5	9.1	9.3	8.8	9.0	9.0	8.8	9.1	8.6	8.9	107.6
Total United States	1,186.8	1,062.5	1,184.0	1,129.2	1,138.4	1,130.8	1,194.0	1,189.4	1,176.3	1,226.9	1,211.5	1,210.0	14,039.8
Daily average	38.3	37.9	38.2	37.6	36.7	37.7	38.5	38.4	39.2	39.6	40.4	39.0	38.5

[1] Exclusive of California.

[2] Estimated with production of by-product coke as basis.

Spot price of Oklahoma natural gasoline, grade A, on specified dates, with monthly and yearly averages, 1926 and 1927, in cents per gallon

[Oil and Gas Journal]

Date	Cents	Date	Cents
1926		1927	
Jan. 4	10.75–10.88	Jan. 4	9.5
Jan. 11	10.25–10.75	Jan. 11	9
Jan. 18	10 –10.5	Jan. 18	8.25
Jan. 25	9.5 – 9.75	Jan. 25	7.5
Average	10.33	Average	8.5
Feb. 1	10	Feb. 1	7.56
Feb. 8	10.25–10.38	Feb. 8	7.75
Feb. 15	10.25	Feb. 15	7.5
Feb. 22	10	Feb. 22	7
Average	10.13	Average	7.44
Mar. 1	9.5 – 9.75	Mar. 1	6.5
Mar. 8	9.5 – 9.75	Mar. 8	6.25
Mar. 15	9 – 9.25	Mar. 15	5.25
Mar. 22	9	Mar. 22	5
Mar. 29	9 – 9.25	Mar. 29	5
Average	9.3	Average	5.6
Apr. 5	9 – 9.13	Apr. 5	5
Apr. 12	8.88– 9	Apr. 12	4.75
Apr. 19	9	Apr. 19	4.75
Apr. 26	9 – 9.25	Apr. 26	4.63
Average	9.03	Average	4.78
May 3	10.75–11	May 3	4.63
May 10	10.5 –10.75	May 10	5
May 17	11	May 17	5.75
May 24	10.5	May 24	6.13
Average	10.75	May 31	6
June 1	10.25–10.5	Average	5.5
June 7	9.75–10	June 7	5.5
June 14	9.25	June 14	5
June 21	9.63– 8.88	June 21	4.75
June 28	8.5	June 28	4.5
Average	9.35	Average	4.94
July 6	8.25	July 5	4.5
July 12	8.25– 8.5	July 12	4.5
July 19	8.25– 8.5	July 19	4.88
July 26	8.5 – 8.63	July 26	5
Average	8.39	Average	4.72
Aug. 2	8.5 – 8.63	Aug. 2	5
Aug. 9	8.63– 8.75	Aug. 9	5.5
Aug. 16	9.25	Aug. 16	6
Aug. 23	9.75	Aug. 23	6
Aug. 30	10	Aug. 30	6
Average	9.25	Average	5.7
Sept. 7	10.25–10.5	Sept. 5	5.75
Sept. 13	10.25–10.38	Sept. 13	5.5
Sept. 20	10.25	Sept. 20	6
Sept. 27	9.75–10	Sept. 27	6
Average	10.20	Average	5.81
Oct. 4	9.5 – 9.75	Oct. 4	6
Oct. 11	9.25– 9.5	Oct. 11	6
Oct. 18	9 – 9.25	Oct. 18	6.13
Oct. 25	9 – 9.25	Oct. 25	6
Average	9.31	Average	6.03
Nov. 1	9.25– 9.5	Nov. 1	6
Nov. 8	9.25– 9.5	Nov. 8	5.88
Nov. 15	9.25– 9.38	Nov. 15	5.75
Nov. 22	9.25– 9.5	Nov. 22	5.75
Nov. 29	9.13– 9.25	Nov. 29	5.75
Average	9.3	Average	5.83
Dec. 6	9.25– 9.5	Dec. 6	5.5
Dec. 13	9.5	Dec. 13	5.38
Dec. 20	9.75	Dec. 20	5.13
Dec. 27	9.75– 9.88	Dec. 27	5.25
Average	9.61	Average	5.32
Average for the year	9.58	Average for the year	5.84

STONE

By A. T. Coons

SUMMARY OF PRODUCTION

The total stone sold or used by producers in the United States in 1927 amounted to 10 per cent more in quantity and 5 per cent more in value than in 1926. Granite, basalt, marble, limestone, and "other stone" made gains in both quantity and value. Sandstone showed an increase in quantity but a decrease in value.

The tables in this report give the quantities sold or used by producers and the values f. o. b. at quarries and mills, so far as these are obtainable. Stone quarried and used by the producer is considered as sold and is included in the figures given for sales. The figures do not, however, include the stone made into abrasives (such as grindstones, etc.), glass sand, lime, or cement and reported in terms of finished product. These products are treated in the Mineral Resources chapters on abrasives, sand and gravel, lime, and cement; but an estimate of the total amount of limestone used for all purposes is given on page 234.

Stone sold or used by producers in the United States, 1918–1927, by kinds

[Quantities approximate]

Year	Granite		Basalt and related rocks (trap rock)		Marble		Limestone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1918	3, 827, 400	$14, 466, 423	6, 859, 200	$7, 782, 280	305, 720	$5, 496, 389	53, 868, 200	$49, 453, 006
1919	4, 221, 220	19, 345, 714	7, 410, 770	8, 944, 686	333, 400	8, 042, 297	49, 759, 800	53, 171, 701
1920	4, 760, 000	24, 954, 908	9, 219, 200	12, 260, 148	431, 500	11, 069, 585	59, 290, 000	75, 655, 260
1921	4, 752, 180	20, 592, 217	8, 524, 480	11, 450, 899	315, 400	8, 580, 416	45, 621, 000	57, 749, 594
1922	5, 913, 120	21, 125, 869	10, 032, 900	12, 600, 611	427, 870	10, 534, 671	58, 928, 660	68, 397, 927
1923	7, 300, 130	29, 704, 796	10, 674, 470	13, 539, 648	562, 560	12, 863, 974	76, 701, 360	89, 620, 007
1924	6. 883, 860	28, 772, 161	11, 671, 500	14, 679, 523	516, 000	13, 302, 235	75, 894, 430	89, 868, 956
1925	8, 074, 200	30, 531, 347	11, 842, 110	14, 770, 042	564, 150	13, 882, 457	85, 649, 440	98, 008, 028
1926	9, 330, 390	32, 044, 523	12, 977, 740	15, 950, 302	563, 170	14, 167, 480	91, 887, 900	109, 252, 299
1927	10, 706, 740	35, 287, 206	13, 210, 570	17, 399, 949	600, 060	15, 625, 872	99, 662, 270	112, 439, 824

Year	Sandstone		Other stone [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	2, 858, 100	$4, 529, 298	844, 740	$973, 034	68, 563, 360	$82, 700, 430
1919	2, 623, 270	5, 283, 842	1, 190, 540	1, 920, 903	65, 539, 000	96, 709, 143
1920	3, 343, 000	7, 310, 290	1, 483, 300	2, 291, 769	78, 527, 000	133, 541, 960
1921	2, 640, 460	6, 425, 339	1, 685, 220	2, 163, 801	63, 538, 740	106, 962, 266
1922	3, 388, 130	7, 521, 044	1, 520, 880	1, 886, 806	80, 211, 560	122, 066, 928
1923	4, 349, 270	9, 174, 706	3, 730, 870	4, 567, 110	103, 318, 660	159, 470. 241
1924	3, 894, 690	10, 142, 099	4, 323, 640	5, 105, 139	103, 184, 120	161, 870, 113
1925	4, 479, 330	10, 920, 016	5, 242, 140	6, 104, 902	115, 851, 370	174, 216, 792
1926	4, 978, 530	11, 149, 029	4, 758, 630	5, 744, 957	124, 496, 360	188, 308, 590
1927	5, 050, 600	10, 923, 035	7, 114, 890	6, 971, 336	136, 345, 130	198, 647, 222

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[1] Includes mica schist, conglomerate, argillite, various light-colored volcanic rocks, serpentine not used as marble, and such other stone as can not be properly classed in any of the main groups.

The demand during the year varied with the use of the stone and with local conditions. Stone sold for curbing, rubble, riprap, crushed stone, agricultural limestone, manufacturing industries, and other miscellaneous uses increased in both quantity and value. Stone sold for construction decreased somewhat in quantity (4 per cent) but increased slightly (less than 2 per cent) in value. Monumental stone decreased less than 1 per cent in quantity but increased 3 per cent in value. The number of paving blocks sold decreased 2 per cent, but the average weight per block was somewhat greater than in 1926; the value of the blocks increased 5 per cent. Limestone and marble sold for fluxing purposes and dolomitic limestone used as a refractory decreased in both quantity and value. Operating costs were little different from 1926. Prices for high-grade stone and cut stone were somewhat higher and for crushed stone of all kinds somewhat lower.

Stone sold or used by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building stone cubic feet	33, 467, 420	$39, 922, 851	32, 104, 200	$40, 595, 127
Approximate equivalent in short tons	2, 609, 190		2, 485, 120	
Monumental stone cubic feet	4, 335, 770	14, 580, 929	4, 325, 390	14, 978, 691
Approximate equivalent in short tons	359, 950		358, 000	
Paving blocks number	39, 563, 180	3, 399, 602	38, 705, 560	3, 583, 400
Approximate equivalent in short tons	366, 370		366, 740	
Curbing cubic feet	4, 409, 930	4, 303, 280	4, 862, 580	4, 939, 716
Approximate equivalent in short tons	346, 020		378, 230	
Flagging cubic feet	902, 424	657, 435	737, 680	573, 736
Approximate equivalent in short tons	66, 330		55, 160	
Rubble short tons	539, 670	917, 433	809, 020	998, 108
Riprap do	4, 060, 280	4, 652, 717	4, 618, 500	4, 716, 731
Crushed stone do	82, 515, 560	87, 872, 014	94, 948, 770	97, 474, 267
Furnace flux (limestone and marble) do	23, 859, 390	18, 049, 012	21, 666, 070	15, 985, 525
Refractory stone (ganister, mica schist, and dolomite) short tons	1, 531, 070	1, 925, 832	1, 362, 920	1, 710, 708
Agricultural limestone do	1, 850, 620	3, 064, 235	2, 206, 470	3, 360, 704
Manufacturing industries (limestone and marble) short tons	4, 953, 800	4, 376, 026	5, 352, 130	4, 735, 114
Other uses do	1, 438, 110	4, 587, 224	1, 738, 000	4, 995, 395
Total (quantities approximate in short tons)	124, 496, 360	188, 308, 590	136, 345, 130	198, 647, 222

Building stone.—Aggregate sales of building stone of all kinds decreased 4 per cent in quantity and increased less than 2 per cent in value over 1926. Limestone decreased 6 per cent in quantity. Marble showed a small decrease in quantity but an increase of 14 per cent in value from 1926. Granite for building decreased 22 per cent in quantity; this decrease was caused by the decrease of 29 per cent in the quantity of stone sold for rough construction and of 24 per cent in rough blocks sold for architectural building. Dressed granite, including dressed constructional stone and dressed architectural stone, increased 30 per cent in quantity sold. Sandstone increased 19 per cent in quantity but decreased 4 per cent in value. Basalt used for building declined in quantity but increased in value. Miscellaneous stone, chiefly volcanic tuff and argillite, used for building showed a large increase in output. Cut stone was the only class of building stone to show increase in both quantity and value. Tables showing the sales of building limestone at the principal quarry centers are given on pages 234 to 238 of this report. The figures of building stone by kinds as reported for 1926 and 1927 are as follows:

Building stone sold or used by producers in the United States, 1926 and 1927, by kinds

Kind	Rough				Finished				Total	
	Constructional		Architectural		Sawed[1]		Cut[1]			
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
1926										
Granite	6,105,350	$852,265	1,150,130	$943,746	[1] 228,430	[1] $944,021	[1] 698,000	[1] $4,143,481	8,181,910	$6,883,513
Basalt	336,140	31,107	----------	----------	----------	----------	----------	----------	336,140	31,107
Marble	----------	----------	1,043,220	2,242,339	949,220	2,180,736	875,500	4,996,864	2,867,940	9,419,939
Limestone	3,361,470	380,131	6,161,390	3,837,081	5,650,210	6,003,282	3,364,880	10,171,103	18,537,950	20,391,597
Sandstone	809,780	97,192	889,980	555,136	1,378,140	1,524,757	268,650	977,122	3,346,550	3,154,207
Miscellaneous	196,930	42,488	----------	----------	----------	----------	----------	----------	196,930	42,488
	10,809,670	1,403,183	9,244,720	7,578,302	8,206,000	10,652,796	5,207,030	20,288,570	33,467,420	39,922,851
1927										
Granite	4,324,280	708,571	868,810	941,706	[1] 317,990	[1] 1,325,886	[1] 886,750	[1] 4,695,949	6,397,830	7,672,112
Basalt	276,000	33,281	----------	----------	----------	----------	----------	----------	276,000	33,281
Marble	----------	----------	859,050	2,027,236	867,390	1,985,012	1,097,350	6,726,980	2,823,790	10,739,228
Limestone	2,575,800	292,792	5,953,780	3,832,414	5,420,620	4,849,151	3,390,490	9,845,688	17,340,690	18,820,045
Sandstone	1,743,170	215,937	875,090	588,077	1,156,530	1,215,113	220,580	1,006,737	3,995,370	3,025,864
Miscellaneous	1,249,000	279,108	21,520	25,489	----------	----------	----------	----------	1,270,520	304,597
	10,168,250	1,529,689	8,578,250	7,414,922	7,762,530	9,375,162	5,595,170	22,275,354	32,104,200	40,595,127

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[1] For granite, sawed stone corresponds to dressed stone for construction work (walls, foundations, bridges) and cut stone to architectural stone for high-class buildings.

Monumental stone.—Stone for monumental and memorial work decreased less than 1 per cent in quantity but increased 3 per cent in value in 1927 compared with 1926. Granite declined 1 per cent in quantity but gained 3 per cent in value. Marble increased 3 per cent in quantity and 1 per cent in value.

Paving blocks, curbstone, flagstone, and crushed stone.—Street and road material in general showed larger sales in 1927, although paving blocks declined 2 per cent in quantity and flagstones 18 per cent. Stone for curbing increased 10 per cent in quantity. The total quantity of crushed stone sold increased 15 per cent over 1926; the total value increased 11 per cent. Crushed stone for concrete and road work in 1927 gained 17 per cent in quantity and 12 per cent in value, and crushed stone reported for railroad ballast gained 5 per cent in quantity and 4 per cent in value over 1926.

Fluxing stone.—Stone used by blast furnaces, open-hearth steelworks, smelters, and other metallurgic plants for fluxing decreased 9 per cent in quantity.

Refractory stone.—Stone (dolomite, quartzite, and mica schist) reported for refractory use decreased 11 per cent in quantity. The raw dolomite reported for the manufacture of refractories in 1927 decreased 15 per cent in quantity. Exact figures for raw dolomite for this purpose are hard to obtain because sales to furnaces and smelters tend to cause it to be reported as fluxing stone. Operators who both quarry and dead-burn or sinter dolomite reported 374,415 short tons of the sintered material, valued at $3,459,803, for 1927—a decrease of 3 per cent in quantity. Quartzite (ganister) used in the manufacture of refractory brick for furnace or converter lining and for the manufacture of ferrosilicon decreased 9 per cent in quantity in 1927, and mica schist used as furnace and kiln lining decreased 21 per cent.

Agricultural limestone.—Sales of agricultural limestone increased 19 per cent in quantity in 1927 as compared with 1926, and burned lime used for agriculture (322,893 short tons, valued at $2,237,871, as given in the report of this series on lime) increased 9 per cent.

Manufacturing industries and "other uses."—The total quantity of stone for manufacturing industries and "other uses" increased 11 per cent in 1927.

PRODUCTION BY STATES

Pennsylvania ranks as the largest producer of stone and is followed closely by Ohio, but Indiana ranks first in value of stone produced. The quarry output of Indiana is nearly two-thirds less than that of Pennsylvania, but the value of its stone is nearly 20 per cent more than that of Pennsylvania on account of the large amount of high-grade building stone produced in Indiana. The stone from Pennsylvania is nearly all in the form of broken or crushed stone.

The following table shows the relative importance of the different States in quantity and value of stone produced:

Stone sold or used by producers in the United States, 1926 and 1927, by States

State	1926			1927		
	Number of active plants	Short tons (approximate)	Value	Number of active plants	Short tons (approximate)	Value
Alabama	19	1,296,440	$2,048,193	18	1,238,750	$1,797,375
Alaska	1	(1)	(1)	1	(1)	(1)
Arizona	9	685,970	397,632	7	311,930	297,206
Arkansas	16	388,200	435,108	9	418,770	486,792
California	162	9,248,240	10,546,571	161	9,764,740	9,963,054
Colorado	44	911,450	1,107,867	45	[2] 883,140	[2] 975,953
Connecticut	34	[2] 2,069,920	[2] 2,680,849	39	2,295,360	3,202,040
Delaware	3	99,150	157,637	2	(1)	(1)
District of Columbia	4	5,890	20.526	3	6,630	21,350
Florida	53	6,785,430	7,411,506	53	7,437,580	6,138,767
Georgia	45	820,570	5,470,561	40	[2] 849,290	[2] 6,146,613
Hawaii	11	399,900	849,302	9	449,640	1,034,164
Idaho	17	[2] 179 320	[2] 295,209	23	286,410	400,160
Illinois	72	[2] 9,145,180	[2] 8,479,277	72	9.699,530	8,127.506
Indiana	98	4,699.230	22,797,189	88	5,813,000	22,634.359
Iowa	27	938,520	897,262	30	1,274,380	1,231,546
Kansas	47	[2] 850.560	[2] 1,057,276	40	801,450	922,532
Kentucky	72	1,907,960	2,168,183	88	2,603,770	2,863,779
Louisiana	2	122,870	207,883	1	115,450	169.643
Maine	49	311,830	2,360,593	48	355,800	2,447,644
Maryland	40	[2] 1,432,290	[2] 2.177,102	38	1.214,110	2,039,243
Massachusetts	86	[2] 2.089,340	[2] 6,216,793	90	[2] 2,629,890	[2] 7,291,969
Michigan	28	[2] 10,885,730	[2] 6,715,429	28	[2] 11,442,780	[2] 6,560,946
Minnesota	52	682,800	3,746,392	56	802,340	4,259,766
Mississippi	2	(1)	(1)	2	(1)	(1)
Missouri	123	3,093,000	6,012,013	125	[2] 3,064,600	[2] 5,170,859
Montana	25	[2] 294,120	[2] 257,919	26	219,510	191,021
Nebraska	6	105,740	185,057	4	170.500	332,222
Nevada	6	[2] 59,030	[2] 89,072	16	700,710	570,508
New Hampshire	25	148,250	1,908,284	25	[2] 178,300	[2] 1,584,262
New Jersey	45	2,315,450	3,589,119	44	2,760,880	4,334,526
New Mexico	1	(1)	(1)	1	(1)	(1)
New York	136	9,708,700	13,713,620	140	[2] 10,651,610	[2] 15,830,959
North Carolina	34	[2] 1,843,480	[2] 4,005,087	38	[2] 2,250,870	[2] 4,913,177
Ohio	121	13,103,140	13,763,207	126	[2] 15,631,240	[2] 16,769.636
Oklahoma	29	[2] 1,555,580	[2] 1,485,436	28	[2] 1,720,050	[2] 1,514,538
Oregon	92	2,139,910	2,152,512	103	1,863,830	1,951.631
Pennsylvania	423	[2] 16,628,770	[2] 19,157,336	415	16,015,480	18,999,592
Porto Rico	13	71,630	111,291	12	113,780	209,476
Rhode Island	19	[2] 252,280	[2] 895,718	19	[2] 153,400	[2] 734,164
South Carolina	13	881,180	1,505,869	12	1,197,870	1,992,558
South Dakota	25	211,340	472,032	23	264,500	535,232
Tennessee	42	[2] 1,693.080	[2] 4,170,016	71	2,145,390	6,430,631
Texas	35	3,117,020	2,595,018	42	3,267,940	2,534,866
Utah	21	732,960	623,608	53	[2] 739,830	[2] 561,932
Vermont	42	330,230	9,244,465	38	321,970	9.216,116
Virginia	99	[2] 3.047,220	[2] 3,504,671	92	[2] 3,140,170	[2] 3,320,385
Washington	46	[2] 461,570	[2] 979,482	64	975,850	958,841
West Virginia	40	3,211,650	3,402,327	38	3,171,120	2.962,922
Wisconsin	142	[2] 2,852.070	[2] 4,937,661	144	[2] 3,104,240	[2] 5,181,631
Wyoming	12	153,940	316,463	14	253,230	431,104
Undistributed		528,230	986,967		1,573,520	2,402,026
	2,608	124,496,360	188,308,590	2,704	136,345,130	198,647,222

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[1] Included under "Undistributed."

[2] To avoid disclosing confidential information, certain State totals are slightly incomplete, the figures not included being combined under "Undistributed."

EXPORTS AND IMPORTS[1]

Value of stone exported from the United States, 1918–1927

Year	Marble in blocks, rough or dressed, and other building or monumental stone[1]	Other manufactures of stone[1]	Total	Year	Marble in blocks, rough or dressed, and other building or monumental stone[1]	Other manufactures of stone[1]	Total
1918	$552,261	$1,208,164	$1,760,425	1923	$625,442	$783,195	$1,408,637
1919	770,392	1,508,997	2,279,389	1924	499,602	448,731	948,333
1920	774,442	2,158,764	2,933,206	1925	507,391	725,677	1,233,068
1921	576,905	1,697,570	2,274,475	1926	687,115	896,130	1,583,245
1922	681,658	903,102	1,584,760	1927 [2]	[3] 1,088,949	[4] 1,005,636	2,094,585

[1] Exports classification beginning 1922; prior to 1922 classification read "Stone including marble—unmanufactured and all other."

[2] Figures not separately recorded for 1927 for stone and for cement building blocks and for stone and for cement manufactures.

[3] Composed of "marble in blocks, rough or dressed," $237,233, and "other building or monumental stone (including cement building blocks)," $851,716.

[4] Classification reads "Other manufactures of stone (including other cement manufactures)."

Stone exported from the United States in 1927, by countries

Country	Marble in blocks, rough or dressed		Other building or monumental stone (including cement building blocks)[a]		Other manufactures of stone (including paving blocks and curbing and cement manufactures)[a]	Total value
	Cubic feet	Value	Cubic feet	Value		
North America:						
Canada	52,621	$178,186	323,514	$299,032	$667,129	$1,144,347
Central America—						
British Honduras					686	686
Costa Rica					868	868
Guatemala			20	90	3,349	3,439
Honduras					567	567
Nicaragua					1,298	1,298
Panama	2	85	19	153	6,087	6,325
Salvador	2	10			410	420
Mexico	1,761	14,736	6,907	7,227	38,801	60,764
Newfoundland and Labrador	1,867	11,024			2,690	13,714
West Indies—						
British—						
Barbados	7	104			1,305	1,409
Bermuda			45	380	387	767
Jamaica					1,433	1,433
Trinidad and Tobago	93	249	20	300	231	780
Other	11	238	44	218	2,235	2,691
Cuba	6,252	18,970	49,956	530,355	90,571	639,896
Dominican Republic	9	25	25	150	4,665	4,840
Netherland					93	93
Haiti	1	20			1,796	1,816
Virgin Islands of the United States	1	25	24	95	639	759
Other					269	269
South America:						
Argentina					4,070	4,070
Brazil					3,514	3,514
Chile					3,160	3,160
Colombia	2	15			13,574	13,589
Ecuador					289	289
Peru					990	990
Venezuela	4	40			7,621	7,661
Other					1,749	1,749

[a] Figures not separately recorded for 1927 for stone and for cement building blocks and for stone and for cement manufactures.

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[1] Figures on exports and imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Stone exported from the United States in 1927, by countries—Continued

Country	Marble in blocks, rough or dressed		Other building or monumental stone (including cement building blocks)		Other manufactures of stone (including paving blocks and curbing and cement manufactures)	Total value
	Cubic feet	Value	Cubic feet	Value		
Europe:						
France			40	$85	$11, 906	$11, 991
Germany	261	$1, 500	60	574	18, 375	20, 449
Italy	5	14			999	1, 013
Netherlands					15, 879	15, 879
United Kingdom	76	307	858	3, 324	17, 114	20, 745
Other			58	400	3, 775	4, 175
Asia:						
China			21	100	963	1, 063
India (British)					5, 601	5, 601
Japan	109	507	1, 073	2, 783	7, 963	11, 253
Philippine Islands	8	61			3, 822	3, 883
Other					23, 699	23, 699
Africa:						
British South Africa			40	180	5, 835	6, 015
Other			1	20	550	570
Oceania:						
Australia	2, 227	10, 814	1, 504	5, 950	18, 216	34, 980
New Zealand	60	263	111	300	10, 132	10, 695
Other	1	40			331	371
	65, 380	237, 233	384, 340	851, 716	1, 005, 636	2, 094, 585

Value of stone imported for consumption in the United States, 1918–1927

1918	$268, 577	1923	$2, 641, 337
1919	787, 961	1924	2, 437, 654
1920	1, 795, 575	1925	2, 909, 887
1921	1, 253, 959	1926	3, 523, 578
1922	1, 895, 912	1927	4, 536, 407

Stone imported for consumption in the United States, 1926 and 1927, by kinds

Kind	1926		1927	
	Quantity	Value	Quantity	Value
Marble, breccia, and onyx:				
In blocks, rough, etc.....cubic feet	863, 219	$1, 783, 767	958, 429	$2, 521, 917
Sawed.....do	1, 676	5, 803	812	4, 665
Slabs or paving tiles.....superficial feet	403, 458	222, 230	925, 792	306, 696
All other manufactures		438, 712		561, 990
Mosaic cubes of marble or onyx:				
Loose		6, 618		9, 144
Attached to paper		410		74
		2, 457, 540		3, 404, 486
Granite:				
Dressed		324, 794		319, 644
Rough.....cubic feet	235, 176	287, 116	188, 395	257, 470
		611, 910		577, 114
Stone (other):				
Dressed		17, 183		27, 830
Rough (monumental or building stone).....cubic feet	256, 950	181, 040	279, 422	240, 987
Rough (other)		255, 905		285, 990
		454, 128		554, 807
Grand total		3, 523, 578		4, 536, 407

Marble, breccia, and onyx (rough and manufactured) imported into the United States, 1926 and 1927, by countries

[General imports]

Country	1926				1927			
	Rough marble, breccia, and onyx		Manufactured	Total value	Rough marble, breccia, and onyx		Manufactured	Total value
	Cubic feet	Value			Cubic feet	Value		
Canada	221	$675	$9, 339	$10, 014	14	$58	$4, 429	$4, 487
Cuba			442	442			895	895
Guatemala			22	22				
Mexico	16, 270	72, 389	383	72, 772	26, 509	96, 062	2, 264	98, 326
Total North America	16, 491	73, 064	10, 186	83, 250	26, 523	96, 120	7, 588	103, 708
Belgium	72, 834	99, 517	50, 362	149, 879	93, 915	166, 763	65, 153	231, 916
France	71, 662	109, 699	79, 857	189, 556	68, 098	132, 431	109, 056	241, 487
Germany	14, 104	35, 513	96, 318	131, 831	7, 225	17, 408	85, 172	102, 580
Greece	17, 379	68, 841	49	68, 890	16, 273	69, 457	124	69, 581
Italy	662, 251	1, 378, 369	391, 490	1, 769, 859	726, 281	1, 997, 092	552, 445	2, 549, 537
Netherlands			43	43			500	500
Spain	5, 094	11, 769	1, 609	13, 378	11, 839	27, 104	1, 928	29, 032
United Kingdom	776	2, 133	7, 704	9, 837	292	1, 065	15, 836	16, 901
Other Europe [1]	1, 950	3, 789	9, 525	13, 314	501	471	14, 966	15, 437
Total Europe	846, 050	1, 709, 630	636, 957	2, 346, 587	924, 424	2, 411, 791	845, 180	3, 256, 971
China			22, 616	22, 616			16, 401	16, 401
Japan			9, 049	9, 049			8, 031	8, 031
Other countries [2]	2, 838	8, 935	5, 699	14, 634	3, 146	22, 895	2, 929	25, 824
	2, 838	8, 935	37, 364	46, 299	3, 146	22, 895	27, 361	50, 256
Grand total	865, 379	1, 791, 629	684, 507	2, 476, 136	954, 093	2, 530, 806	880, 129	3, 410, 935

[1] 1926: Austria, Czechoslovakia, Denmark and Faroe Islands, Finland, Gibraltar, Hungary, Poland and Danzig, Sweden, and Switzerland; 1927: Austria, Czechoslovakia, Denmark, Finland, Gibraltar, Hungary, Irish Free State, Latvia, Malta, Rumania, Sweden, Switzerland, and Yugoslavia and Albania.

[2] 1926: Aden, Algeria and Tunisia, Australia, Bolivia, Ceylon, Egypt, Hong Kong, India (British), Morocco, Newfoundland and Labrador, Palestine, Syria, Turkey in Asia, and Uruguay; 1927: Algeria and Tunisia, Argentina, Australia, Ceylon, Chile, Egypt, Hong Kong, India (British), Palestine, and Siam.

Value of building or monumental stone (exclusive of marble, breccia, and onyx) and other classes of stone imported into the United States, 1926 and 1927, by countries

[General imports]

Country	1926			1927		
	Building or monumental stone	Other stone	Total	Building or monumental stone	Other stone	Total
North America:						
Canada	$71, 931	$243, 206	$315, 137	$43, 359	$275, 235	$318, 594
Mexico	60		60			
Total North America	71, 991	243, 206	315, 197	43, 359	275, 235	318, 594
Europe:						
Austria				26		26
Belgium	940		940	282	20	302
Czechoslovakia	54, 030		54, 030	37, 675		37, 675
Denmark		452	452		755	755
Finland	104, 909		104, 909	126, 921		126, 921
France	63, 266		63, 266	59, 908	21	59, 929
Germany	191, 810	6, 838	198, 648	84, 597	3, 919	88, 516
Italy	202, 783	9	202, 792	264, 754		264, 754
Netherlands	3	21, 148	21, 151		2, 871	2, 871
Norway	10, 093	1, 055	11, 148	17, 806	970	18, 776
Portugal	6, 100		6, 100	9, 029		9, 029
Spain	4, 557		4, 557			
Sweden	203, 847	1, 145	204, 992	165, 611		165, 611
United Kingdom	55, 458	5, 898	61, 356	51, 345	2, 062	53, 407
Other Europe				8, 944		8, 944
Total Europe	897, 796	36, 545	934, 341	826, 898	10, 618	837, 516
Other countries [1]	11, 310	97	11, 407	3, 458	582	4, 040
Grand total	981, 097	279, 848	1, 260, 945	873, 715	286, 435	1, 160, 150

[1] 1926: China, Hong Kong, India (British), Japan, New Zealand, and Palestine; 1927: Australia, Chile, China, Egypt, Hong Kong, Hungary, India (British), Japan, Malta and Gozo and Cyprus, Palestine, and Switzerland.

PRODUCTION BY KINDS AND STATES

GRANITE

The output of granite in 1927 increased 15 per cent in quantity and 10 per cent in value over 1926. Crushed stone, which comprised 69 per cent of the total quantity of granite produced in 1927, increased 15 per cent in output and riprap increased 22 per cent; there was a large increase in the stone sold as rubble. Building stone decreased 22 per cent in quantity but increased 11 per cent in value. Granite sold for rough construction and that sold rough for architectural work decreased in both quantity and value, whereas granite sold as dressed stone for construction and architectural work increased. Granite for monumental work showed a small decrease in quantity but an increase of 3 per cent in value. Granite paving blocks and curbing also showed small decreases in output but increases in value.

Granite sold or used by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building stone (rough and dressed)..........cubic feet..	8, 181, 910	$6, 883, 513	6, 397, 830	$7, 672, 112
Approximate equivalent in short tons..............	677, 370	-----------	537, 360	-----------
Monumental stone..........................cubic feet..	3, 240, 550	10, 533, 072	3, 197, 910	10, 881, 442
Approximate equivalent in short tons..............	266, 940	-----------	262, 180	-----------
Paving..........................number of blocks..	37, 148, 000	3, 223, 327	35, 949, 790	3, 368, 178
Approximate equivalent in short tons..............	340, 320	-----------	334, 230	-----------
Curbing...................................linear feet..	3, 503, 370	2, 402, 284	3, 431, 290	2, 605, 478
Approximate equivalent in short tons..............	182, 430	-----------	171, 130	-----------
Rubble...................................short tons..	121, 910	182, 306	484, 770	426, 587
Riprap...do....	1, 195, 090	1, 194, 092	1, 453, 390	1, 327, 510
Crushed stone....................................do....	6, 469, 100	7, 459, 139	7, 416, 860	8, 894, 201
Other uses.......................................do....	77, 230	166, 790	46, 820	111, 698
Total (quantities approximate, in short tons).....	9, 330, 390	32, 044, 523	10, 706, 740	35, 287 206

Granite sold or used by producers in the United States, 1926 and 1927, by States

[Quantities approximate]

State	1926		1927	
	Short tons	Value	Short tons	Value
Arizona	576, 910	$205, 014	(1)	(1)
Arkansas	(1)	(1)	-----------	-----------
California	2, 840, 850	3, 603, 270	3, 026, 210	$3, 439, 119
Colorado	62, 210	194, 386	29, 270	179, 591
Connecticut	92, 890	547, 632	96, 140	660, 014
Delaware	99, 150	157, 637	(1)	(1)
District of Columbia	5, 890	20, 526	6, 630	21, 350
Georgia	536, 170	2, 243, 491	595, 040	2, 730, 937
Idaho	-----------	-----------	(1)	(1)
Maine	221, 210	2, 204, 030	225, 910	2, 242, 262
Maryland	283, 010	512, 749	328, 740	602, 293
Massachusetts	706, 170	4, 062, 460	779, 120	4, 461, 922
Minnesota	31, 920	2, 200, 116	45, 940	2, 672. 239
Missouri	10, 010	97, 685	21, 430	90, 133
Montana	32, 130	60, 756	21, 880	34, 300
New Hampshire	148, 250	1, 908, 284	178, 300	1, 584, 262
New Jersey	(1)	(1)	(1)	(1)
New York	103, 200	646, 200	117, 370	850, 158
North Carolina	1, 621, 830	3, 670, 067	1, 866, 950	4, 453, 971
Oklahoma	59, 230	164, 248	31, 550	143, 228
Oregon	(1)	(1)	(1)	(1)
Pennsylvania	269, 590	692, 139	357, 010	843, 704
Rhode Island	54, 620	549, 255	77, 780	574, 229
South Carolina	881, 180	1, 505, 869	1, 197, 870	1, 992, 558
South Dakota	1, 830	177, 299	4, 450	215, 168
Texas	7, 790	186, 765	10, 970	153, 208
Utah	880	8, 325	9, 700	14, 213
Vermont	117, 200	3, 908, 917	111, 770	3, 982. 272
Virginia	254, 710	383, 883	495, 950	559, 898
Washington	24, 430	115, 248	279, 190	187, 412
Wisconsin	252, 900	1, 935, 168	318, 980	2, 158, 522
Undistributed	34, 230	83, 104	472, 590	440. 243
	9, 330, 390	32, 044, 523	10, 706, 740	35, 287, 206

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[1] Included under "Undistributed."

Granite sold or used by producers in the United States in 1927, by States and uses

State	Number of active plants	Building						Monumental stone				Paving blocks	
		Rough				Dressed		Rough		Dressed			
		Construction		Architectural									
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Number	Value
Arizona	2												
California	33	740	$1,588	3,610	$5,409	107,340	$804,481	80,500	$192,413	23,020	$199,563		
Colorado	6							(2)	(2)	[2]17,470	[2]146,198		
Connecticut	14	4,390	7,373	(2)	(2)	[2]43,200	[2]279,174	52,990	124,322	10,210	96,561	(1)	(1)
Delaware	2	(1)	(1)										
District of Columbia	3	(1)	(1)										
Georgia	30	3,840	3,444			97,110	588,535	[3]236,770	[3]453,970	(3)	(3)	5,457,410	$405,615
Idaho	1												
Maine	40	1,570	2,032	349,330	304,075	68,410	312,082	56,430	64,888	17,370	89,914	13,594,610	1,247,600
Maryland	9	132,970	272,826	[3]15,570	[3]35,683	(3)	(3)	2,500	3,250			5,000	500
Massachusetts	47	23,340	22,737	233,310	328,117	340,750	940,512	302,430	435,097	57,160	421,061	6,272,790	679,209
Minnesota	26			11,600	17,991	257,480	1,208,826	78,080	195,013	149,540	1,222,981	289,000	25,291
Missouri	4	(1)	(1)			(1)	(1)	(1)	(1)			(1)	(1)
Montana	11	(1)	(1)			(1)	(1)	4,680	5,669	1,890	17,960		
New Hampshire	24	2,470	2,681	76,010	108,934	71,050	591,894	69,460	117,750	29,210	182,680	2,563,580	187,301
New Jersey	2	(1)	(1)										
New York	15			(2)	(2)	[2]99,600	[2]533,777	13,500	19,881	25,970	125,847	697,640	61,084
North Carolina	30	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	3,139,980	196,074
Oklahoma	8	210	210	550	275			26,700	30,458	8,660	89,185		
Oregon	2									(1)	(1)		
Pennsylvania	33	148,230	334,861	60,800	36,270	2,250	12,250	7,500	20,413	14,680	104,181	67,780	6,290
Rhode Island	10	(1)	(1)			(1)	(1)	[3]103,490	[3]437,413	(3)	(3)		
South Carolina	12	(1)	(1)	(1)	(1)			(1)	(1)			(1)	(1)
South Dakota	6	(1)	(1)	(1)	(1)					28,650	208,188		
Texas	7			8,820	11,933	8,500	17,000	39,230	84,392	2,590	25,038		
Utah	4			(1)	(1)			(1)	(1)				
Vermont	25			(2)	(2)	[2]22,360	[2]171,296	[3]1,286,170	[3]3,801,561	(3)	(3)	(1)	(1)
Virginia	8	3,680	6,365							(1)	(1)		
Washington	9			390	390	2,200	9,496	11,030	11,565	3,790	49,562		
Wisconsin	23	5,000	4,001	(1)	(1)	(1)	(1)	9,430	17,404	115,680	1,169,809	3,261,360	509,643
Undistributed		39,420	50,453	102,540	101,992	90,770	543,149	269,450	444,369	41,680	272,886	600,640	49,571
	446	365,860	708,571	868,810	941,706	1,204,740	6,021,835	2,620,940	6,270,204	576,970	4,611,238	35,949,790	3,368,17

State	Curbing		Rubble		Riprap		Crushed stone				Other uses		Total	
							Concrete and road metal		Railroad ballast					
	Linear feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Arizona			(1)	(1)	(1)	(1)			(1)	(1)			(1)	(1)
California	3,000	$2,894	1,160	$1,197	1,064,650	$969,672	1,284,740	$916,958	651,070	$338,821	6,070	$6,123	3,026,210	$3,439,119
Colorado							27,810	33,393					29,270	179,591
Connecticut	33,320	42,968			33,810	19,767	46,170	82,595			(1)	(1)	96,140	660,014
Delaware					(1)	(1)	(1)	(1)					(1)	(1)
District of Columbia	(1)	(1)	(1)	(1)									6,630	21,350
Georgia	1,445,690	791,559	63,730	46,600	20,340	24,758	342,900	391,127	30,150	25,141	750	188	595,040	2,730,937
Idaho			(1)	(1)									(1)	(1)
Maine	154,340	164,529			10,170	10,456	37,280	46,686					225,910	2,242,262
Maryland	11,000	3,947	4,260	8,763	(1)	(1)	120,250	171,893	27,390	54,773	(1)	(1)	328,740	602,293
Massachusetts	626,460	598,545	22,750	22,810	33,600	34,403	494,370	931,660	13,890	26,524	8,220	21,247	779,120	4,461,922
Minnesota					1,900	1,387	650	750					45,940	2,672,239
Missouri					(1)	(1)	(1)	(1)					21,430	90,133
Montana			16,980	1,419	4,210	3,371					10	99	21,880	34,300
New Hampshire	320,660	267,201			42,280	32,024	65,760	81,739			8,990	12,058	178,300	1,584,262
New Jersey							(1)	(1)					(1)	(1)
New York	(1)	(1)	3,160	825	2,900	2,900	22,390	27,770	(1)	(1)	(1)	(1)	117,370	850,158
North Carolina	778,120	685,183	24,260	80,615	(1)	(1)	1,537,030	2,320,908	197,740	198,032	3,160	22,761	1,866,950	4,453,971
Oklahoma							28,350	23,100					31,550	143,228
Oregon							(1)	(1)					(1)	(1)
Pennsylvania	(1)	(1)	44,490	94,122			105,010	162,311	40,000	48,000	(1)	(1)	357,010	843,704
Rhode Island	1,200	1,334					49,070	97,387	1,500	1,700			77,780	574,229
South Carolina	(1)	(1)	6,250	8,154	7,620	12,038	1,072,680	1,568,671	92,150	63,554			1,197,870	1,992,558
South Dakota							(1)	(1)					4,450	215,168
Texas	12,000	9,500	80	125	5,220	5,220							10,970	153,208
Utah							9,480	11,200			(1)	(1)	9,700	14,213
Vermont							(1)	(1)					111,770	3,982,272
Virginia	(1)	(1)			(1)	(1)	182,170	224,823	(1)	(1)			495,950	559,898
Washington			241,150	102,576	36,410	13,397					200	426	279,190	187,412
Wisconsin	21,660	15,819	26,110	22,192	6,310	5,482	241,260	398,596			(1)	(1)	318,980	2,158,522
Undistributed	23,840	21,999	30,390	37,189	183,970	192,635	155,440	293,945	540,160	352,144	19,420	48,796	472,590	440,243
	3,431,290	2,605,478	484,770	426,587	1,453,390	1,327,510	5,822,810	7,785,512	1,594,050	1,108,689	[4] 46,820	[4] 111,698	10,706,740	35,287,206

[1] Included under "Undistributed."

[2] Rough stone included under dressed stone.

[3] Dressed stone included under rough stone.

[4] Includes 3,360 tons of Durax blocks, valued at $31,467, made in Massachusetts, New Hampshire, North Carolina, and Wisconsin.

The following table gives statistics covering sales of monumental granite by the quarrymen at Quincy, Mass., during the past 10 years. The quarry operators furnishing this stone in 1927 were the Granite Railway Co., Gray Rock Granite Co., C. H. Hardwick & Co., Quincy Quarries Co., and J. S. Swingle, all of Quincy; these quarries also furnished stone for construction. Crushed-stone plants also are operated in the vicinity of Quincy.

Monumental granite sold by the quarrymen at Quincy, Mass., 1918–1927

Year	Number of active plants	Short tons (approximate)	Value	Year	Number of active plants	Short tons (approximate)	Value
1918	5	26, 000	$336, 843	1923	6	27, 150	$596, 709
1919	8	32, 000	614, 005	1924	6	26, 630	527, 915
1920	8	27, 000	674, 233	1925	7	26, 500	509, 329
1921	6	14, 000	311, 178	1926	7	23, 000	438, 963
1922	6	16, 000	341, 601	1927	5	21, 130	375, 613

The following table shows the quantity and value of monumental granite sold by the quarrymen in the Barre district of Vermont during the past 10 years. The quarry operators in this district in 1927 were the Barre Granite Quarrying Co., Capitol Hill Quarry Co., Jones Bros. (Inc.), Littlejohn & Milne Quarry Co., James K. Pirie Estate, Rock of Ages Corporation, E. L. Smith & Co., Standard Granite Co. (Inc.), Steel Quarry Co., Wells-Lamson Quarry Co., and Wetmore & Morse Granite Co., all of Barre. Granite from this district is used also for construction and for the manufacture of paving blocks.

Monumental granite sold by the quarrymen in the Barre district, Vermont, 1918–1927

Year	Cubic feet	Value	Year	Cubic feet	Value
1918	1, 369, 000	$2, 308, 757	1923	1, 208, 010	$3, 300, 805
1919	1, 376, 000	3, 623, 055	1924	1, 025, 930	3, 366, 497
1920	1, 147, 800	3, 957, 881	1925	981, 560	3, 192, 282
1921	686, 947	2, 417, 024	1926	1, 062, 160	3, 311, 066
1922	453, 000	1, 395, 911	1927	1, 115, 400	3, 426, 732

Through the kindness of P. L. Bailey, secretary of the Barre Granite Manufacturers' Association, the following figures covering the entire granite industry of the Barre district are given to supplement the figures of sales reported to the Bureau of Mines by the quarrymen.

Estimated output of monumental granite in Barre district, Vermont, 1924–1927

	1924	1925	1926	1927
Total quarry output, rough stock ……cubic feet	1, 127, 850	1, 161, 684	1, 169, 322	1, 179, 822
Shipped out of Barre district in rough ……do	225, 570	232, 336	233, 884	235, 964
Manufactured in Barre district ……do	902, 280	929, 348	935, 438	943, 858
Light stock consumed in district ……do	563, 925	580, 843	584, 649	589, 910
Dark stock consumed in district ……do	338, 355	348, 505	350, 789	353, 948
Number of cutters in district	1, 000	1, 100	1, 100	1, 200
Average daily wage	$8. 00	$8. 00	$8. 00	$9. 00
Average number of days worked	250	275	272	227
Total pay roll for year	$2, 000, 000	$2, 420, 000	$2, 393, 600	$2, 451, 600
Estimated overhead	1, 000, 000	1, 210, 000	1, 196, 800	1, 225, 800
Estimated value of light stock	2, 352, 585	2, 613, 789	2, 630, 973	2, 654. 600
Estimated value of dark stock	2, 023, 223	1, 873, 215	1, 885, 533	1, 902, 463
Estimated polishing cost	585, 500	735, 000	739, 830	743, 500
Output from saws	248, 000	245, 000	246, 610	325, 000
Total value of granite	8, 209, 308	9, 097, 004	9, 093, 346	9, 302, 963

The figures of quantity submitted by Mr. Bailey represent the stone carried from the quarries. The figures of the Bureau of Mines represent the sales of stone as reported by the quarrymen.

BASALT AND RELATED ROCKS (TRAP ROCK)

Basalt and related rocks produced in 1927 increased 2 per cent in quantity and 9 per cent in value over 1926. Crushed stone, which is the chief product, increased 2 per cent in quantity and 7 per cent in value. Under "Other" is reported 113,980 short tons of roofing granules, valued at $799,151, made chiefly from altered diabase (greenstone). In the figures for granite and miscellaneous varieties of stone is also an amount of "roofing granules," which increases the total output of roofing granules made from stone to 136,340 short tons, valued at $858,630. Besides these "roofing granules," others of slate (including slate "flour") amounting to 459,760 tons, valued at $2,775,962, were sold by producers in 1927.

Basalt and related rocks (trap rock) sold or used by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building stone..........cubic feet..	336, 140	$31, 107	276, 000	$33, 281
Approximate equivalent in short tons..........	28, 730	----------	23, 300	----------
Paving blocks..........number..	100, 000	5, 000	----------	----------
Approximate equivalent in short tons..........	600	----------	----------	----------
Rubble..........short tons..	111, 070	166, 904	67, 610	125, 319
Riprap..........do....	233, 340	333, 690	297, 780	583, 688
Crushed stone..........do....	12, 494, 260	14, 781, 858	12, 686, 250	15, 832, 220
Other (principally roofing granules)..........do....	109, 740	631, 743	135, 630	825, 441
Total (quantities approximate, in short tons)......	12, 977, 740	15, 950, 302	13, 210, 570	17, 399, 949

Basalt and related rocks (trap rock) sold or used by producers in the United States, 1926 and 1927, by States

[Quantities approximate]

State	1926		1927	
	Short tons	Value	Short tons	Value
Arkansas..........	(1)	(1)	----------	----------
California..........	2, 159, 790	$1, 810, 893	943, 700	$877, 088
Colorado..........	(1)	(1)	----------	----------
Connecticut..........	1, 959, 850	2, 116, 091	2, 150, 000	2, 446, 806
Hawaii..........	399, 900	849, 302	449, 640	1, 034, 164
Idaho..........	144, 350	163, 359	231, 980	271, 540
Maryland..........	756, 050	1, 087, 491	562, 280	894, 381
Massachusetts..........	1, 066, 870	1, 329, 609	1, 383, 110	1, 543. 715
Michigan..........	96, 990	303, 601	107, 000	317, 195
Minnesota..........	211, 780	327, 411	227, 050	459, 603
Montana..........	(1)	(1)	(1)	(1)
New Jersey..........	2, 053, 130	3, 139, 316	2, 388, 700	3, 654, 404
New York..........	(1)	(1)	(1)	(1)
Oregon..........	1, 749, 410	1, 746, 074	1, 443, 150	1, 527, 447
Pennsylvania..........	1, 472, 930	2, 068, 773	1, 602, 210	2, 266, 435
Texas..........	136, 260	127, 975	(1)	(1)
Virginia..........	57, 770	107, 005	11, 920	18, 253
Washington..........	343, 770	318, 846	629, 010	477, 746
Wisconsin..........	(1)	(1)	(1)	(1)
Undistributed..........	368, 890	454, 556	1, 080, 820	1, 611, 172
	12, 977, 740	15, 950, 302	13, 210, 570	17, 399, 949

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[1] Included under "Undistributed."

Basalt and related rocks (trap rock) sold or used by producers in the United States in 1927, by uses

State	Number of active plants	Building, rough construction		Rubble and riprap		Crushed stone				Other uses		Total	
						Concrete and road metal		Railroad ballast					
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
California	15	(1)	(1)	101,350	$80,791	780,500	$670,335	44,640	$34,950	(1)	(1)	943,700	$877,088
Connecticut	17			28,100	22,212	1,926,550	2,227,620	195,350	196,974			2,150,000	2,446,806
Hawaii	9			(1)	(1)	324,040	576,166	(1)	(1)	(1)	(1)	449,640	1,034,164
Idaho	15					231,980	271,540					231,980	271,540
Maryland	9	(1)	(1)	(1)	(1)	312,750	523,686	241,290	361,552	(1)	(1)	562,280	894,381
Massachusetts	17	540	$803			1,179,850	1,326,496	202,720	216,416			1,383,110	1,543,715
Michigan	6					(1)	(1)			(1)	(1)	107,000	317,195
Minnesota	5			(1)	(1)	143,520	193,245	(1)	(1)	(1)	(1)	227,050	459,603
Montana	7			(1)	(1)							(1)	(1)
New Jersey	31	60	79			2,040,390	3,198,869	348,250	455,456			2,388,700	3,654,404
New York	3					(1)	(1)	(1)	(1)			(1)	(1)
Oregon	93	(1)	(1)	52,500	64,590	1,311,070	1,406,004	79,380	56,653	(1)	(1)	1,443,150	1,527,447
Pennsylvania	23	7,950	13,822	2,490	3,044	1,090,320	1,401,570	434,640	522,092	66,810	$325,907	1,602,210	2,266,435
Texas	1	(1)	(1)			(1)	(1)	(1)	(1)			(1)	(1)
Virginia	1					11,920	18,253					11,920	18,253
Washington	41			46,080	71,576	547,310	365,893	34,950	34,945	670	5,332	629,010	477,746
Wisconsin	1					(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed		14,750	18,577	134,870	466,794	864,570	1,394,794	340,260	378,711	68,150	494,202	1,080,820	1,611,172
	294	23,300	33,281	365,390	709,007	10,764,770	13,574,471	1,921,480	2,257,749	135,630	825,441	13,210,570	17,399,949

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[1] Included under "Undistributed."

MARBLE

The marble sold by producers in 1927 increased 7 per cent in quantity and 10 per cent in value over 1926. The quantity of building stone reported was 2 per cent less, but its value was 14 per cent more than in 1926. There was an increase of 3 per cent in quantity and 1 per cent in value of monumental marble reported. There is included in the figures of marble some "onyx" marble quarried in Arizona and used to a small extent for interior building but more largely for novelties, such as gear-shift balls, lamp bases, paper weights, etc. The figures for marble include also serpentine produced for building construction. Because of the number of producers of this serpentine and its distinctive qualities the production is also shown separately from marble on page 224.

Marble sold by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building stone:				
Rough—				
Exterior cubic feet	345, 840	$834. 347	144, 130	$291, 596
Interior do	697, 380	1, 407, 992	714, 920	1, 735, 640
Finished—				
Exterior do	778, 150	2, 516, 087	706, 340	2, 534, 483
Interior do	1, 046, 570	4, 661, 513	1, 258, 400	6, 177, 509
Total exterior do	1, 123, 990	3, 350, 434	850, 470	2, 826, 079
Total interior do	1, 743, 950	6, 069, 505	1, 973, 320	7, 913, 149
Total building stone do	[1] 2, 867, 940	[1] 9, 419, 939	[1] 2, 823. 790	[1] 10, 739, 228
Monumental stone:				
Rough do	138, 710	140, 414	149, 920	149, 468
Finished do	956, 510	3, 907, 443	977, 560	3, 947, 781
Total monumental stone do	[1] 1, 095, 220	[1] 4, 047, 857	[1] 1, 127, 480	[1] 4, 097, 249
Total building and monumental cubic feet	3, 963, 160	13, 467, 796	3, 951, 270	14, 836, 477
Total building and monumental approximate short tons	335, 950		333, 820	
Marble for other uses (by-products) short tons	227, 220	699, 684	266, 240	789, 395
Total marble, approximate short tons	563, 170	14, 167, 480	600, 060	15, 625. 872

[1] Building-stone figures may be somewhat less than given and monumental stone somewhat more, as some of the Tennessee producers were unable to divide their product according to use.

Marble sold by producers in the United States, 1926 and 1927, by States and uses

State	Building and monumental (rough and finished)		Other uses		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1926						
Alabama	123, 580	$704, 524	23, 520	$69, 459	34, 020	$773, 983
California	38, 820	119, 461	5, 120	19, 575	8, 420	139, 036
Georgia	519, 860	2, 800, 649	14, 000	14, 500	59, 100	2, 815, 149
Massachusetts	30, 810	148, 508	1, 430	2, 488	4, 030	150, 996
Missouri	687, 840	1, 446, 272	540	711	57, 530	1, 446, 983
New York	99, 620	282, 493	72, 070	390, 829	80, 730	673, 322
Tennessee	934, 770	2, 427, 897	45, 290	53, 427	124, 130	2, 481, 324
Vermont	1, 422, 830	5, 116, 290	51, 810	73, 674	172, 750	5, 189, 964
Other States [1]	105, 030	421, 702	13, 440	75, 021	22, 460	496, 723
	3, 963, 160	13, 467, 796	227, 220	699, 684	563, 170	14, 167, 480
1927						
Alabama	101, 920	614, 910	28, 720	56, 178	37, 380	671, 088
California	24, 170	74, 001	1, 530	12, 924	3, 580	86, 925
Georgia	553, 140	3, 053, 879	7, 500	11, 700	54, 520	3, 065, 579
Massachusetts	31, 980	183, 321	1, 760	2, 830	4, 480	186, 151
Missouri	537, 520	1, 089, 251	22, 880	18, 908	67, 460	1, 108, 159
New York	61, 700	192, 924	48, 610	281, 520	54, 000	474, 444
Tennessee	998, 980	4, 099, 237	97, 610	71, 108	181, 870	4, 170, 345
Vermont	1, 482, 710	5, 047, 116	42, 400	49, 600	168, 070	5, 096, 716
Other States [1]	159, 150	481, 838	15, 230	284, 627	28, 700	766, 465
	3, 951, 270	14, 836, 477	266, 240	789, 395	600, 060	15, 625, 872

[1] Alaska, Arizona, Arkansas, Colorado, Maryland, Nevada, New Jersey, North Carolina, Pennsylvania, Utah, Virginia, and Washington.

SERPENTINE

The figures showing sales of serpentine (verde antique) for interior and exterior building, dimension stone, and by-products are included in the figures for marble, but those showing sales of serpentine as crushed stone for road metal, ballast, riprap, and other low-grade material are included in the figures for "miscellaneous" stone. The States represented in the production of serpentine in 1927 are California, Maryland, Massachusetts, New Jersey, Pennsylvania, Vermont, and Washington.

Serpentine (verde antique) sold by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building and ornamental stone .... cubic feet	58, 430	$423, 358	100, 000	$641, 845
Rough construction, crushed, etc .... short tons	11, 800	51, 358	22, 930	94, 730
	----------	474, 716	----------	736, 575

PRODUCING LOCALITIES—MARBLE, "ONYX," AND SERPENTINE

The locations of the marble, "onyx," and serpentine deposits in the United States active in 1927 and the operators of these deposits, by States, are as follows:

Alabama.—Marble was produced in Alabama for commercial purposes in 1927 by the Alabama Marble Co., at Gantts Quarry, the Madras Marble Corporation, and the Moretti-Harrah Marble Co., at Sylacauga. This marble is sold for building and monumental work, with the broken stone for terrazzo, riprap, and crushed stone, and has been recently used for exterior work on the Atlantic National Bank Building, Jacksonville, Fla., and for interior work in the Book-Cadillac Hotel, Detroit, Mich., the Alabama Power Co. Building, Birmingham, Ala., and the Jeweler's Building, Chicago, Ill.

Alaska.—The only marble quarries operated in Alaska are those of the Vermont Marble Co. (Proctor, Vt.) at Tokeen and Calder. The stone is shipped in rough blocks from the quarries to finishing plants and is used entirely for interior building.

Arizona.—Deposits of "onyx" marble were operated in 1927 at Cave Creek, Maricopa County, by the Arizona Onyx Products (Inc.), and at Mayer, Yavapai County, by the Yavapai Onyx Corporation. This "onyx" marble is used chiefly for gear-shift balls, lamp and ink well bases, and gift-shop novelties, and to a smaller extent for interior building work. The stone quarried at Mayer is shipped to Dubuque, Iowa, for finishing; it has been used for interior work in the building at 900 North Michigan Avenue, Chicago, Ill.

Arkansas.—The marble quarries at Batesville, Independence County, Ark., are operated by the Batesville Marble Quarries Co. The stone is much used locally for trimmings. It was used for the construction of the Methodist church at Jonesboro, Ark., and for the buildings of the University of Arkansas, at Fayetteville, Ark. Stone was also shipped to Canada in 1927.

California.—The only marble quarries in California operated in 1927 for dimension stone were those of The Columbia Marble Co., at Columbia, Tuolumne County. The stone was used for both interior and exterior building. In the same county Walter S. McLean and the Tuolumne National Marble Co. produced marble for terrazzo and stucco from quarries at Sonora. The Inyo Marble Co., Lone Pine, Inyo County, produced marble for terrazzo, fluxing, and chemical uses. L. Cardini, lessee of the Tolenas quarry, Suisun, Solano County, quarried some "onyx," or travertine, for use with cement in making cast stone.

Colorado.—The marble quarries at Marble, Gunnison County, were operated by the Colorado Consolidated Yule Marble Co. and produced stone for exterior and interior building and for mausoleums. Development work was done on other properties near Marble, but no stone was marketed.

Georgia.—The only marble sold for building and monumental stone in Georgia in 1927 was from the quarries of the Georgia Marble Co., at Tate, Pickens County. This company also reopened a "verde antique" (serpentine) deposit near Hollysprings, Cherokee County, but no stone was marketed. Among the important recent constructions from Georgia marble have been the Territorial capitol and the Victory Memorial at San Juan, P. R., the Buckingham Fountain, Chicago, Ill., the Harding Memorial, Marion, Ohio, and the Alexander Stephens Statue in Statuary Hall of the Capitol at Washington, D. C. For the bowl of the Buckingham Fountain, said to be one of the largest and most beautiful in the world, four blocks were used, each weighing 76 tons when first quarried. In 1926 and 1927 Georgia marble was shipped to Cuba, Porto Rico, and Japan.

Maryland.—The Beaver Dam Marble Co. (address, 305 Federal Street, Baltimore) quarried and sold marble for exterior building in 1927 from the quarries at Cockeysville, Baltimore County. The Cockeysville stone was also sold for stucco, grit, agriculture, and other crushed-stone products. Serpentine was quarried near Cardiff, Harford County, by the Cardiff Green Marble Co. This stone was used for construction, for terrazzo, and as pulverized stone.

Massachusetts.—The Lee Marble Works is the only company now quarrying marble in Massachusetts. The quarry is at Lee, Berkshire County, and has for many years furnished marble to the Government for marking the graves of soldiers of various wars. It is also used for exterior and interior building construction. Serpentine was quarried in Massachusetts by the Westfield Marble Quarries (Inc.) (successor to Westfield Marble & Sandstone Co.), at Westfield, Hampden County. The stone is all sold to manufacturers in rough blocks.

Missouri.—The production of stone in the Carthage marble district is shown on page 238. This is the largest marble district in Missouri, and at present the building and monumental stone quarries are operated by the Carthage Marble Corporation, successor to several individual companies formerly operating in the district. The Carthage stone has been used recently in the following buildings: City hall, St. Joseph (exterior and interior); Empire Building, Joplin (exterior); Masonic Temple, Salina, Kans. (exterior); Lincoln Square Building, Springfield, Ill. (interior); and American Furniture Mart, Chicago, Ill. (interior). The Phenix Marble Co. (address, Scarritt Building, Kansas City, Mo.) quarried marble at Phenix, Greene County, chiefly for interior work. Stone from this quarry was used for the interior of the Russ Building, San Francisco, Calif., and of the State Capitol, Lincoln, Nebr. The Joplin Marble Quarries Co., Joplin, operated quarries in Newton County, near Joplin. The Ozark Marble Quarries Co. (address, Victoria Building, St. Louis) operated marble quarries near St. Marys, Ste. Genevieve County, and stone from these quarries has been used for interior work in the Stephens Hotel, Pure Oil Co. Building, and Palmer House, Chicago, Ill.; Book-Cadillac Building, Detroit, Mich.; Masonic Temple, Paul Brown Building, and Central National Bank Building, St. Louis; French Building, New York City; and Peabody Hotel, Memphis, Tenn.

Nevada.—Plymire Bros., Luning, reported a production of marble from property near Luning, Mineral County, as used for terrazzo work.

New Jersey.—Rock Products Co. (address, Easton, Pa.) produced serpentine for construction and terrazzo from the Lizzie Clay & Pulp Co. quarry at Phillipsburg, Warren County.

New York.—The marble sold in 1927 from quarries in New York State was produced by the following companies:

Clinton County:
  Bluff Point—Vermont Marble Co. (address, Proctor, Vt.); quarry idle during 1927; shipments to finishing mills in Vermont made from stock.
  Plattsburg—Day Quarry Co.; stone sold in rough blocks for exterior building.
Dutchess County: Wingdale—South Dover Marble Co. (address, One hundred and Thirty-third Street and Walnut Avenue, New York City); stone quarried and shipped in rough blocks for exterior construction. Marble from this quarry was used for St. Luke's Hospital, New York City, the Labor National Bank, Jersey City, N. J., and Montclair Post Office, Montclair, N. J.

St. Lawrence County:
  Gouverneur—
    DeKalb White Marble Co.; marble from this quarry was used entirely for the manufacture of cast stone in 1927.
    Gouverneur Marble Co.; in 1927 marble from this quarry was sold chiefly for memorial work and was used in the Comerford memorial, Wilkes-Barre, Pa. Some stone was also shipped to Canada.
Westchester County:
  Tuckahoe—
    Benedict Stone Co. (address, 35 West Forty-second Street, New York City); stone crushed and sold for manufacture of cast and artificial stone, stucco, etc.
    Conlin Marble Co. (Inc.); product all sold as crushed or pulverized stone for stucco and as marble dust and flour for various purposes.
    Kapailo Manufacturing Co. (address, Pershing Square Building, New York City); product crushed and sold for manufacture of cast and artificial stone, stucco, poultry grit, etc.

North Carolina.—The quarry of the Regal Blue Marble Co., Murphy Cherokee County, was operated under receivership in 1927. In 1926 this stone was used in the construction of the Cherokee County Courthouse at Murphy. It has also had wide use as a monumental stone.

Pennsylvania.—In 1927 H. L. McLinans operated the marble quarry near West Grove, Chester County, formerly operated by the Penn Marble & Granite Co. The stone was used in the construction of St. Patricks School, Kennett Square, Pa.; of a church at Wilmington, Del.; and in other local building. Serpentine was quarried near Wrightsdale, Lancaster County, by the Octoraro Stone Co. and was used for stucco, terrazzo, and road work. The "Sylvan Green" quarry of the Rock Products Co., Easton, Northampton County, was not in operation in 1927, but sales were made from stock. The stone has been used in the interior of Walter Reed Hospital, Washington, D. C., and in the administration building of the Board of Education, Pittsburgh, Pa.

Tennessee.—Marble quarries in Blount, Knox, Lincoln, and Union Counties in Tennessee were operated in 1927 by the following:

Blount County:
  Friendsville—John J. Craig Co. (address, Knoxville); Craig quarry.
  Kiser—Andres Stone & Marble Co. (address, Milwaukee, Wis.).
  Louisville—Light Pink Marble Co.; "Anderson Pink" quarry. This stone has been used in the interior of the Indiana war memorial, Indianapolis, Ind.; the Cleveland Library, Cleveland, Ohio; Dallas Exchange Building, Dallas, Tex.; Fidelity-Philadelphia Trust Co. Building, Philadelphia, Pa.; and the Root memorial, New York City.
Knox County:
  Knoxville—
    Appalachian Marble Co. Stone from this quarry has recently been used for interior work in the Philadelphia Building, Pittsburgh, Pa.; First National Bank Building, Altoona, Pa.; Monroe City Courthouse, Monroe, La.; Union Terminal Station, Chicago, Ill., and the Tribune Tower, Chicago, Ill. It is also shipped to England, Canada, and Cuba.
    Bond Marble Co.; "Bond Pink" quarry.
    John J. Craig Co.; Boyd quarry.
    Gray Eagle Marble Co.; succeeded January 1, 1928, by Knoxville Marble Co.
    Gray Knox Marble Co.; Gray Knox, Consolidated, and Asbury quarries. Stone from these quarries has been used in the interior of Builders Building, Chicago, Ill.; City Hall Annex, Philadelphia, Pa.; and National Press Building, Washington, D. C.

Knox County—Continued.
  Knoxville—Continued.
    Knoxville Marble Co.; Knoxville quarry. Stone from this quarry and from the Luttrell quarry in Union County has been used for interior work in the Municipal Building, Brooklyn, N. Y.; the Insurance Co. of North America Building, Philadelphia, Pa.; public auditorium and the United Bank Building, Cleveland, Ohio; Harvey Building, West Palm Beach, Fla.; Breakers Hotel, Palm Beach, Fla.; Ohio Merchants Trust Building, Massillon, Ohio; and St. Monica Church, Cincinnati, Ohio.
    The Ross & Republic Marble Co.; Ross quarry.
    Tennessee Producers Marble Co.; Gray quarry. This stone was used for interior work in the Post-Dispatch Building, Dallas, Tex.; Canal Bank & Trust Co. Building, New Orleans, La.; and Chattanooga Bank & Trust Co., Chattanooga, Tenn.
Lincoln County: Brighton—Tennessee Marble & Brick Co. (address, Fayetteville) (successor to National Marble Co.); stone sold as mill blocks, terrazzo, and marble meal or stucco.
Union County:
  Luttrell—
    Knoxville Marble Co. (address, Knoxville).
    The Ross & Republic Marble Co. (address Knoxville); Republic quarry.

Utah.—The only marble quarry operated commercially in Utah in 1927 was that of the Mt. Nebo Marble Co. (address, Salt Lake City) at Thistle, Utah County. Stone from this quarry was used for interior work in the Arizona Temple, Mesa, Ariz.; the Los Angeles Gas & Electric Building, Los Angeles, Calif.; Driscol National Bank, Philadelphia, Pa.; and Federal Reserve Bank, Salt Lake City.

Vermont.—Vermont ranks first in the production of high-grade marble for monumental and building work. Stone for terrazzo, stucco, paper mills, and other industrial uses is also furnished by the marble quarries. The following firms operate marble quarries in Vermont:

Bennington County: South Dorset—Clarendon Marble Co. (address, West Rutland); Imperial quarry; development work done but no stock marketed.
Franklin County: Swanton—Vermont Marble Co. (address, Proctor); "Champlain Red" marble for interior work produced at this quarry.
Grand Isle County: Isle La Motte—Vermont Marble Co. (address, Proctor); black marble for interior work produced at this quarry; much of product shipped to mills of this company at Proctor for finishing.
Rutland County:
  Brandon, Danby, Pittsford, Proctor, and West Rutland—Vermont Marble Co. (address, Proctor); marble for exterior and interior building, monuments, and mausoleums shipped from these quarries; greater part of the stone sold from the mills at Proctor as sawed or finished stone. Stone from the other quarries of this company is also milled at Proctor, and sold from there.
  Pittsford—Venetian Co. (address, Rutland); rough blocks for monumental work produced in 1927.
  West Rutland—
    Clarendon Marble Co.; rough stone and dressed stone for exterior and interior building, mausoleums, and monuments sold from the quarries and mills of this company.
    Colonial Marble Corporation (address, West Rutland); in 1927 stone quarried by this company from the Eastman quarries, but shipments from the quarry and mill not made until January, 1928.
Washington County: Roxbury—Vermont Marble Co. (address, Proctor); serpentine (verde antique) produced at this quarry and sold in rough blocks; also shipped to mills of the company, milled, and sold as finished stone.
Windsor County: Rochester—Vermont Marble Co. (address, Proctor); serpentine (verde antique) produced at this quarry and sold in rough blocks; also shipped to mills of the company, milled, and sold as finished stone.

Virginia.—Black marble quarried by the American Black Marble Corporation (address, 220 West Forty-second Street, New York City) at Harrisonburg, Rockingham County, has been sold as stucco, terrazzo, and other crushed stone. It is stated, however, that in 1928 the company intends to produce slabs for interior work and tile.

Washington.—Deposits of serpentine near Chewelah and Valley, Stevens County, are operated intermittently for terrazzo, stucco, cast stone, etc. In 1927 the Manufacturers Mineral Co., 1107 West Idaho Street, Seattle; J. J. McGrath, Valley; and the Spokane Plastic Magnesite Co., Spokane, reported sales of stone for these uses.

LIMESTONE

The output of limestone in 1927 increased 8 per cent in quantity and 3 per cent in value as compared with 1926. Crushed stone for roads, concrete, and ballast, which amounted to 65 per cent of the total output, increased 16 per cent in quantity and 10 per cent in value. Limestone for other street work, for riprap, sugar factories, paper mills, agriculture, and miscellaneous industries as a whole also increased in output. There was a decrease in both quantity and value of building stone sold.

Limestone sold or used by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building stone [1] ... cubic feet	18,537,950	$20,391,597	17,340,690	$18,820,045
Approximate equivalent in short tons	1,394,220		1,278,620	
Curbing, flagging, and paving ... cubic feet	167,780	135,882	223,370	134,360
Approximate equivalent in short tons	12,800		18,670	
Rubble ... short tons	254,240	476,545	226,280	400,790
Riprap ... do	1,815,550	1,898,951	2,185,380	2,119,557
Crushed stone ... do	56,267,040	57,436,179	65,080,400	63,411,465
Fluxing stone ... do	23,849,700	18,021,449	21,660,820	15,977,484
Sugar factories ... do	416,920	771,488	483,800	881,370
Glass factories ... do	326,280	543,163	247,210	420,415
Paper mills ... do	202,460	319,998	289,010	436,204
Agriculture ... do	1,850,620	3,064,235	2,206,470	3,360,704
Other uses [2] ... do	5,498,070	6,192,812	5,985,610	6,477,430
Total (quantities approximate, in short tons)	91,887,900	109,252,299	99,662,270	112,439,824

[1] Figures for building stone include small amounts of monumental stone.

[2] See table on p. 234 for further distribution of limestone products.

Limestone sold or used by producers in the United States, 1926 and 1927, by States

[Quantities approximate]

State	1926		1927	
	Short tons	Value	Short tons	Value
Alabama	1, 212, 890	$1, 214, 328	1, 164, 130	$1, 079, 137
Arizona	(1)	(1)	(1)	(1)
Arkansas	52, 090	57, 725	67, 760	82, 128
California	198, 490	454, 770	231, 640	503, 890
Colorado	687, 330	740, 138	651, 550	681, 742
Connecticut	(1)	(1)	29, 260	53, 340
Florida	6, 572, 870	7, 177, 565	7, 137, 230	5, 895, 857
Georgia	225, 300	411, 921	199, 730	350, 097
Idaho	(1)	(1)	28, 150	77, 376
Illinois	9, 145, 180	8, 479, 277	9, 650, 270	8, 095, 086
Indiana	4, 678, 230	22, 767, 999	5, 803, 860	22, 621, 976
Iowa	938, 520	897, 262	1, 274, 380	1, 231, 546
Kansas	850, 560	1, 057, 276	787, 770	895, 030
Kentucky	1, 876, 320	2, 048, 226	2, 426, 250	2, 615, 622
Louisiana	120, 290	198, 473	115, 450	169, 643
Maine	64, 620	100, 763	122, 070	188, 852
Maryland	393, 230	576, 862	310, 550	403, 875
Massachusetts	77, 120	327, 324	92, 100	355, 771
Michigan	10, 788, 740	6, 411, 828	11, 335, 780	6, 243, 751
Minnesota	379, 520	1, 096, 023	463, 070	1, 009, 702
Mississippi	(1)	(1)	(1)	(1)
Missouri	2, 997, 940	4, 410, 180	2, 975, 710	3, 972, 567
Montana	196, 180	155, 148	146, 230	131, 994
Nebraska	105, 740	185, 057	170, 500	332, 222
Nevada	18, 920	32, 789	(1)	(1)
New Jersey	218, 640	353, 605	233, 550	388, 551
New York	9, 163, 560	10, 955, 863	10, 380, 640	13, 401, 838
North Carolina	221, 650	335, 020	242, 490	316, 356
Ohio	12, 716, 170	10, 675, 736	15, 126, 450	13, 006, 789
Oklahoma	1, 496, 350	1, 321, 188	1, 688, 500	1, 371, 310
Oregon	15, 120	29, 044	(1)	(1)
Pennsylvania	13, 250, 290	13, 447, 371	12, 382, 070	13, 025, 863
Porto Rico	71, 630	111, 291	113, 780	209, 476
Rhode Island	(1)	(1)	(1)	(1)
South Dakota	72, 570	94, 617	32, 360	34, 261
Tennessee	1, 568, 950	1, 688, 692	1, 959, 990	2, 246, 319
Texas	2, 907, 770	2, 210, 828	3, 101, 400	2, 217, 559
Utah	365, 880	346, 012	618, 290	419, 844
Vermont	40, 280	145, 584	42, 130	137, 128
Virginia	2, 531, 350	2, 736, 956	2, 499, 710	2, 539, 196
Washington	67, 940	78, 643	57, 630	94, 162
West Virginia	3, 029, 150	3, 013, 437	3, 108, 450	2. 876, 975
Wisconsin	2, 344, 710	2, 478, 929	2, 523, 990	2, 588, 527
Wyoming	148, 220	305, 383	253, 230	431, 104
Undistributed	77, 590	123, 166	114, 170	143, 362
	91, 887, 900	109, 252, 299	99, 662, 270	112, 439, 824

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[1] Included under "Undistributed."

Limestone sold or used by producers in the United States in 1927, by States and uses

State	Number of active plants	Building [1]						Rubble		Riprap		Crushed stone			
		Rough construction		Rough architectural		Finished (sawed and cut)						Concrete and road metal		Railroad ballast	
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	11			(2)	(2)			(2)	(2)	(2)	(2)	43,480	$39,114	152,540	$74,190
Arizona	2											(2)	(2)		
Arkansas	4											63,790	71,888		
California	21											55,930	56,449	(2)	(2)
Colorado	22			(2)	(2)							(2)	(2)	(2)	(2)
Connecticut	4											(2)	(2)		
Florida	49	(2)	(2)							52,330	$88,263	6,754,810	5,486,096	327,100	312,188
Georgia	8											112,800	135,704	(2)	(2)
Idaho	5														
Illinois	69	(2)	(2)	(2)	(2)			14,270	$24,309	620,180	639,534	6,436,870	5,231,749	1,159,160	746,757
Indiana	87	80	$180	5,452,360	$3,466,865	8,601,800	$14,198,048	4,360	4,122	169,160	52,639	3,462,430	3,701,765	732,850	737,081
Iowa	30	(2)	(2)					(2)	(2)	124,400	123,321	866,590	839,463	105,140	92,773
Kansas	38	5,780	12,780			10,150	8,235	3,210	4,744	33,420	37,578	549,310	635,984	179,930	164,709
Kentucky	83	3,630	8,016	201,470	119,254			(2)	(2)	37,700	54,388	1,580,590	1,741,435	672,580	496,302
Louisiana	1											108,010	162,280	7,440	7,363
Maine	5											67,220	77,378		
Maryland	17	10,190	11,180									284,110	342,180	(2)	(2)
Massachusetts	9											(2)	(2)		
Michigan	20									(2)	(2)	1,644,540	1,110,522	188,160	125,000
Minnesota	19	(2)	(2)	124,870	145,075	91,660	304,064	5,360	13,366	58,100	40,681	348,340	441,829		
Mississippi	2														
Missouri	111	(2)	(2)	(2)	(2)	(2)	(2)	145,720	240,311	404,360	540,955	1,976,440	2,522,539	291,230	337,796
Montana	5									(2)	(2)	28,790	27,933	(2)	(2)
Nebraska	4									44,850	41,217	69,420	70,824	(2)	(2)
Nevada	2													(2)	(2)
New Jersey	7											34,770	41,137		
New York	74	44,500	53,369			(2)	(2)	(2)	(2)	137,980	155,587	7,918,390	10,525,059	988,290	883,657
North Carolina	5											204,450	242,808		
Ohio	110	9,850	24,875					7,820	16,274	11,730	12,245	9,382,830	8,298,323	1,909,380	1,577,156
Oklahoma	19	(2)	(2)	(2)	(2)			(2)	(2)	35,390	28,067	916,800	853,451	722,970	450,034
Oregon	2														
Pennsylvania	246	29,950	48,452					9,660	13,242	3,500	5,300	4,683,750	5,897,498	69,220	72,693
Porto Rico	12							380	900			61,670	106,371	36,800	53,372
Rhode Island	1														
South Dakota	7	350	300							1,300	1,900	13,170	18,578		

[1] Figures for building stone include small amounts for monumental work.

[2] Included under "Undistributed."

Limestone sold or used by producers in the United States in 1927, by States and uses—Continued

State	Number of active plants	Building						Rubble		Riprap		Crushed stone			
		Rough construction		Rough architectural		Finished (sawed and cut)						Concrete and road metal		Railroad ballast	
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Tennessee	53							(2)	(2)	(2)	(2)	1, 135, 230	$1, 316, 698	616, 660	$492, 660
Texas	32	50, 000	$50, 000	105, 100	$52, 716	(2)	(2)	(2)	(2)	56, 230	$57, 480	1, 325, 850	1, 126, 908	1, 560, 580	836, 505
Utah	20			(2)	(2)					269, 590	121, 527	8, 660	10, 229		
Vermont	6											21, 020	31, 625		
Virginia	78	13, 410	18, 354									1, 030, 970	1, 060, 841	981, 760	842, 692
Washington	6	(2)	(2)												
West Virginia	24											327, 740	341, 659	412, 380	277, 891
Wisconsin	102	22, 180	36, 983	(2)	(2)	(2)	(2)	17, 300	$47, 422	98, 200	95, 674	2, 126, 910	1, 971, 215	55, 450	42, 520
Wyoming	14	(2)	(2)									25, 530	44, 073	28, 340	4, 655
Undistributed		16, 560	28, 303	69, 980	48, 504	107, 500	$184, 492	18, 200	36, 100	26, 960	23, 201	78, 920	57, 370	132, 310	144, 496
	1, 446	206, 480	292, 792	5, 953, 780	3, 832, 414	8, 811, 110	14, 694, 839	226, 280	400, 790	2, 185, 380	2, 119, 557	53, 750, 130	54, 638, 975	11, 330, 270	8, 772, 490

State	Fluxing stone		Sugar factories		Glass factories		Paper mills		Agriculture		Other uses		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Alabama	918, 590	$820, 016							7, 170	$10, 591	20, 800	$56, 182	1, 164, 130	$1, 079, 137
Arizona	(2)	(2)									(2)	(2)	(2)	(2)
Arkansas									(2)	(2)	(2)	(2)	67, 760	82, 128
California	58, 690	106, 011	(2)	(2)	(2)	(2)	(2)	(2)	16, 320	49, 256	64, 250	199, 466	231, 640	503, 890
Colorado	415, 130	400, 364	83, 900	$145, 058									651, 550	681, 742
Connecticut	(2)	(2)							(2)	(2)	(2)	(2)	29, 260	53, 340
Florida									(2)	(2)			7, 137, 230	5, 895, 857
Georgia	(2)	(2)							20, 100	35, 763	50, 280	163, 849	199, 730	350, 097
Idaho	(2)	(2)	(2)	(2)			(2)	(2)	(2)	(2)	(2)	(2)	28, 150	77, 376
Illinois	683, 840	706, 675			(2)	(2)			647, 160	579, 639	73, 000	143, 361	9, 650, 270	8, 095, 086
Indiana	96, 180	27, 218	2, 960	2, 812	74, 280	$117, 920			200, 560	209, 997	41, 980	103, 329	5, 803, 860	22, 621, 976
Iowa	9, 550	12, 146	(2)	(2)					163, 680	156, 069	(2)	(2)	1, 274, 380	1, 231, 546
Kansas									9, 510	10, 607	5, 940	20, 393	787, 770	895, 030
Kentucky	(2)	(2)							57, 910	66, 126	46, 490	110, 402	2, 426, 250	2, 615, 622

Louisiana													115, 450	169, 643
Maine	(2)	(2)					26, 760	$78, 415	(2)	(2)	(2)	(2)	122, 070	188, 852
Maryland	(2)	(2)							(2)	(2)	11, 950	37, 914	310, 550	403, 875
Massachusetts	(2)	(2)					(2)	(2)	45, 810	204, 036	27, 810	117, 318	92, 100	355, 771
Michigan	6, 315, 520	3, 070, 689	(2)	(2)	(2)	(2)	153, 860	180, 393	202, 220	195, 868	2, 770, 150	1, 475, 716	11, 335, 780	6, 243, 751
Minnesota	(2)	(2)							27, 820	30, 210	5, 980	33, 699	463, 070	1, 009, 702
Mississippi									(2)	(2)			(2)	(2)
Missouri	7, 810	10, 277			23, 630	40, 092			61, 750	77, 875	58, 710	161, 192	2, 975, 710	3, 972, 567
Montana	100, 030	71, 535	(2)	(2)	(2)	(2)							146, 230	131, 994
Nebraska	(2)	(2)							12, 430	10, 900	31, 770	193, 228	170, 500	332, 222
Nevada	(2)	(2)	(2)	(2)	(2)	(2)							(2)	(2)
New Jersey	129, 050	120, 871							35, 700	104, 270	34, 030	122, 273	233, 550	388, 551
New York	167, 800	161, 655					13, 650	19, 728	93, 540	297, 854	1, 006, 030	1, 219, 085	10, 380, 640	13, 401, 838
North Carolina									(2)	(2)	(2)	(2)	242, 490	316, 356
Ohio	2, 901, 670	1, 965, 714	(2)	(2)	(2)	(2)	(2)	(2)	164, 110	269, 460	702, 090	784, 522	15, 126, 450	13, 006, 789
Oklahoma					(2)	(2)			(2)	(2)	(2)	(2)	1, 688, 500	1, 371, 310
Oregon							(2)	(2)	(2)	(2)			(2)	(2)
Pennsylvania	6, 979, 280	5, 867, 110			84, 470	167, 910	32, 110	38, 221	65, 930	239, 256	424, 200	676, 181	12, 382, 070	13, 025, 863
Porto Rico			7, 150	4, 292					6, 540	40, 812	1, 240	3, 729	113, 780	209, 476
Rhode Island	(2)	(2)											(2)	(2)
South Dakota			5, 540	7, 323							12, 000	6, 160	32, 360	34, 261
Tennessee	40, 570	42, 005							100, 380	205, 020	61, 780	186, 003	1, 959, 990	2, 246, 319
Texas	26, 040	26, 046			(2)	(2)			(2)	(2)	69, 460	59, 659	3, 101, 400	2, 217, 559
Utah	314, 200	227, 581	25, 170	55, 655							(2)	(2)	618, 290	419, 844
Vermont	(2)	(2)							14, 240	63, 741	(2)	(2)	42, 130	137, 128
Virginia	99, 560	100, 322					(2)	(2)	(2)	(2)	282, 120	366, 849	2, 499, 710	2, 539, 196
Washington	24, 970	22, 127					30, 540	62, 060	(2)	(2)	(2)	(2)	57, 630	94, 162
West Virginia	2, 217, 020	2, 065, 416			17, 300	17, 000			16, 480	54, 968	117, 530	120, 041	3, 108, 450	2, 876, 975
Wisconsin	47, 870	42, 991							103, 530	192, 926	50, 080	125, 232	2, 523, 990	2, 588, 527
Wyoming	(2)	(2)	198, 960	382, 026									253, 230	431, 104
Undistributed	107, 450	110, 715	160, 120	284, 204	47, 530	77, 493	32, 090	57, 387	133, 580	255, 460	34, 510	126, 007	114, 170	143, 362
	21, 660, 820	15, 977, 484	483, 800	881, 370	247, 210	420, 415	289, 010	436, 204	2, 206, 470	3, 360, 704	6, 004, 180	6, 611, 790	99, 662, 270	112, 439, 824

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[2] Included under "Undistributed."

Limestone sold or used by producers in the United States for miscellaneous uses, 1926 and 1927

Use	1926		1927	
	Short tons	Value	Short tons	Value
Alkali works	3, 556, 490	$2, 354, 040	3, 848, 490	$2, 449, 284
Asphalt filler	415, 920	1, 415, 352	420, 860	1, 343, 987
Calcium carbide works	357, 450	234, 889	316, 960	164, 875
Carbonic acid works	(1)	(1)	8, 860	7, 566
Coal mine dusting	26, 620	92, 200	28, 410	91, 495
Filter stone	(1)	(1)	271, 800	272, 834
Magnesia works (dolomite)	72, 850	110, 560	69, 940	115, 932
Mineral food	13, 030	55, 207	30, 470	80, 274
Mineral (rock) wool	18, 880	19, 448	15, 390	12, 962
Poultry grit	17, 450	109, 776	33, 350	198, 144
Refractory stone (dolomite)	511, 300	458, 802	434, 160	424, 140
Road base	217, 170	233, 578	198, 660	236, 317
Roofing gravel	8, 290	16, 366	5, 620	6, 658
Stucco, terrazzo, and artificial stone	82, 340	358, 455	98, 180	348, 797
Whiting substitute	95, 650	549, 139	124, 840	551, 915
Other uses [2]	104, 630	185, 000	79, 620	172, 250
	5, 498, 070	6, 192, 812	5, 985, 610	6, 477, 430

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[1] Included under "Other uses."

[2] Includes stone for ammonia, baking powder, lime burners, nitrates, phosphates, powder, purification of copper, reduction of aluminum ore, soap, sulphuric acid, and uses not specified.

A considerable quantity of the limestone reported in the tables by uses is burned into lime—particularly the limestone reported by iron and steel producers and by alkali, sugar, and paper manufacturers as quarried by them and used in their own plants; also limestone sold to manufacturers of these and other commodities, who may burn it into lime before using it. To avoid duplication, this lime is not included in the figures of production in the chapter on lime. Limestone manufactured into lime and into cement and reported in terms of finished product is treated in separate chapters. The quantities so used are estimated in the following table:

Limestone used for all purposes in the United States, 1923–1927, in short tons

Use	1923	1924	1925	1926	1927
Limestone (as given in this report)	76, 701, 360	75, 894, 430	85, 649, 440	91, 887, 900	99, 662, 270
Portland cement (including "cement rock")	34, 722, 000	37, 727, 000	40, 720, 000	41, 583, 000	43, 800, 000
Natural cement ("cement rock")	212, 000	236, 000	292, 000	391, 000	395, 000
Lime	8, 140, 000	8, 144, 000	9, 100, 000	9, 121, 000	8, 830, 000
	119, 775, 360	122, 001, 430	135, 761, 440	142, 982, 900	152, 687, 270

BUILDING STONE

Of the total quantity of building stone reported in 1927, 54 per cent was limestone, which decreased 6 per cent in quantity from 1926. The high-grade limestone classed as architectural building stone is obtained from a few well-known localities. Such figures as are available covering the output of these districts for a series of years are given in the following tables.

Alabama.—Oolitic limestone used as high-grade building stone is quarried at Rockwood, near Russellville. Figures for the output of this district in 1927 are included in the total sales of limestone but may not be published separately. Besides being used as building stone, this limestone is sold for flux, riprap, rubble, agricultural limestone, and for other purposes.

Limestone sold by producers at Russellville, Franklin County, Ala., 1918–1927

Year	Construction (rough and dressed)		Other		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1918	30, 000	$35, 000	63, 000	$42, 500	65, 000	$77, 500
1919	27, 000	41, 000	110, 000	106, 000	112, 000	147, 000
1920	25, 300	25, 291	143, 000	162, 643	145, 000	187, 934
1921	50, 500	55, 530	15, 000	15, 533	19, 000	71, 063
1922	50, 000	56, 845	97, 000	72, 101	101, 000	128, 946
1923	60, 000	54, 000	184, 800	148, 500	189, 600	202, 500
1924	45, 520	78, 987	96, 560	76, 505	100, 000	155, 492
1925	145, 510	129, 116	156, 610	128, 842	168, 000	257, 958
1926	135, 600	129, 448	137, 200	124, 589	148, 400	254, 037
1927	[1]	[1]	[1]	[1]	[1]	[1]

[1] Bureau of Mines not at liberty to publish figures.

Indiana.—The largest quarry center for building stone in the United States is the oolitic limestone district near Bedford, Lawrence County, and Bloomington, Monroe County, Ind. In 1927 the output of building stone in this district decreased 4 per cent in quantity and 9 per cent in value from 1926. The quarry operators in the district in 1927 and their addresses were as follows: Heltonville Limestone Co., Indiana Limestone Co., Ingalls Stone Co., and Reed-Powers Cut Stone Co., Bedford; Bloomington Limestone Co., Chicago & Bloomington Stone Co., Empire Stone Co., Hoadley Bros. (Inc.), Hunter Bros. Stone Co., Independent Limestone Co., Indiana Oolitic Limestone Co., Indian Hill Stone Co., Maple Hill Quarries Co., Monon Stone Co., Sare-Hoadley Stone Co., and Shawnee Stone Co., Bloomington; Bloomington & Ellettsville Stone Co. and Perry Stone Co., Ellettsville; Indianapolis Oolitic Stone Co. and Swenson Stone Co., Stinesville; and Victor Oolitic Stone Co., Victor.

In January, 1928, the Bloomington Limestone Co., the Chicago & Bloomington Stone Co., the Maple Hill Quarries Co., and the Hoadley-Cline Co. (mill) consolidated as the Bloomington Limestone Co.

Several other companies reported the development of quarries in 1927, with the prospect of production in 1928.

Limestone sold by producers in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1918–1927

Year	Construction		Other		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1918	2, 701, 745	$1, 820, 167	221, 078	$140, 987	417, 000	$1, 961, 154
1919	4, 788, 639	3, 787, 151	174, 463	159, 181	522, 000	3, 946, 332
1920	6, 343, 536	7, 286, 679	278, 235	293, 200	738, 000	7, 579, 879
1921	5, 297, 458	6, 815, 859	141, 068	146, 425	525, 000	6, 962, 284
1922	9, 616, 670	11, 288, 823	214, 722	139, 253	912, 000	11, 428, 056
1923	11, 694, 380	15, 248, 164	233, 180	167, 845	1, 081, 080	15, 416, 009
1924	11, 005, 570	14, 164, 241	255, 930	200, 512	1, 053, 730	14, 364, 753
1925	11, 803, 890	14, 203, 120	290, 990	170, 772	1, 146, 790	14, 373, 892
1926	14, 171, 490	18, 063, 148	405, 630	354, 703	1, 432, 480	18, 417, 851
1927	13, 572, 950	16, 407, 170	423, 320	381, 455	1, 407, 360	16, 788, 625

Limestone sold by producers in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1926 and 1927, by classes

Class	1926		1927	
	Quantity	Value	Quantity	Value
Construction:				
Rough blocks.....cubic feet..	5, 747, 510	$3, 510, 665	5, 445, 970	$3, 461, 369
Sawed.....do....	4, 982, 780	4, 654, 126	5, 268, 060	4, 685, 844
Semifinished.....do....	513, 460	1, 047, 692		
Cut.....do....	2, 927, 740	8, 850, 665	2, 858, 920	8, 259, 957
Total construction.....do....	14, 171, 490	18, 063, 148	13, 572, 950	16, 407, 170
Other stone.....short tons..	405, 630	354, 703	423, 320	381, 455
Grand total (quantities approximate, in short tons).....	1, 432, 480	18, 417, 851	1, 407, 360	16, 788, 625

Other quarries in Indiana operated in 1927 for building stone were those of the St. Paul Stone Quarries Co., St. Paul, Decatur County, and the Ingalls Stone Co., Romona, Owen County.

The mills of the Bedford-Bloomington district, operating in 1927 on stone purchased from quarry operators, and their addresses were as follows:

Bedford Cut Stone Co., the Carl Furst Co., and J. P. Falt Co., Bedford; Central Oolitic Stone Co., Hoadley-Cline Co. (succeeded in January, 1928, by Bloomington Limestone Co.), Matthews Bros. Co., Mutual Oolitic Stone Co., Walker Bros. Stone Co., and H. A. Woolery & Son, Bloomington; and Harding & Cogswell (Inc.) and A. J. Thompson Stone Co., Ellettsville.

A considerable amount of stone is sold by the quarry operators to the finishing mills of the district. The dressed stone sold by these mills is shown in the following tables:

Indiana oolitic limestone sold by mills not operated by quarry companies in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1918–1927 [1]

Year	Cubic feet	Value	Year	Cubic feet	Value
1918.....	624, 736	$647, 851	1923.....	1, 676, 500	$4, 805, 537
1919.....	686, 712	1, 156, 168	1924.....	1, 754, 500	4, 654, 145
1920.....	836, 298	2, 112, 384	1925.....	2, 087, 860	5, 629, 269
1921.....	1, 030, 177	2, 691, 931	1926.....	1, 511, 250	4, 073, 271
1922.....	1, 508, 100	3, 706, 900	1927.....	1, 670, 470	3, 646, 445

[1] Includes some stone purchased by quarry operators and milled and resold.

Indiana oolitic limestone sold by mills not operated by quarry companies in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1926 and 1927, by classes [1]

Year	Sawed		Semifinished		Cut		Total	
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
1926.....	[2] 402, 250	[2] $414, 416	(2)	(2)	1, 109, 000	$3, 658, 855	1, 511, 250	$4, 073, 271
1927.....	728, 000	704, 732	35, 030	$58, 056	907, 440	2, 883, 657	1, 670, 470	3, 646, 445

[1] Includes some stone purchased by quarry operators and milled and resold.
[2] Semifinished stone included under sawed stone.

Kentucky.—The oolitic limestone quarried at Bowling Green, Warren County, Ky., is well known to the trade. It is quarried for building and monumental stone by the Bowling Green Quarries Co. and by William Murphy. There are also several quarries in the vicinity operated for crushed stone. The following table shows the production of the county for the last 10 years:

Limestone sold by producers in Warren County, Ky., 1918–1927

Year	Building and monumental stone (rough and dressed)		Other		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1918	88, 580	$58, 732	2, 470	$2, 684	9, 800	$61, 416
1919	108, 320	100, 817	7, 540	10, 732	16, 500	111, 549
1920	98, 700	123, 010	7, 480	12, 420	15, 600	135, 430
1921	128, 000	170, 540	6, 230	5, 840	16, 800	176, 380
1922	91, 400	143, 012	5, 200	7, 000	12, 740	150. 012
1923	65, 980	113, 040	24, 380	28, 915	29, 660	141, 955
1924	65, 630	120, 882	10, 000	10, 000	14, 920	130, 882
1925	128, 700	226, 646	27, 200	61, 260	37, 500	287, 906
1926	[1] 134, 460	[1] 63, 458	10, 340	10, 130	21, 000	73, 588
1927	[1] 198, 770	[1] 119, 054	73, 350	86, 400	87, 660	205, 454

[1] Rough blocks only.

Minnesota.—The following table shows the sales of limestone at Mankato and Kasota, Minn., for the last 10 years:

Limestone sold by producers at Mankato and Kasota, Minn., 1918–1927

Year	Building stone (rough and dressed)		Other		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1918	85, 998	$95, 615	36, 892	$28, 745	44, 000	$124, 360
1919	57, 959	108, 250	46, 131	60, 007	50, 760	168, 257
1920	104, 865	132, 170	39, 564	54, 485	47, 900	186, 655
1921	111, 487	271, 230	32, 627	41, 409	41, 500	312, 639
1922	151, 110	261, 275	29, 910	32, 329	42, 600	293, 604
1923	138, 890	312, 911	33, 980	34, 867	44, 900	347, 778
1924	130, 660	495, 036	46, 610	43, 152	65, 560	538, 188
1925	320, 050	586, 451	66, 060	60, 179	91, 380	646, 630
1926	245, 330	638, 284	58, 050	32, 655	77, 410	670, 939
1927	199, 640	414, 350	41, 990	26, 766	57, 760	441, 116

T. R. Coughlan Co. and Fowler & Pay, Mankato, and Babcock & Willcox, and Breen Stone & Marble Co., Kasota, are the producers of the Mankato and Kasota stone. The Mantorville Stone Co., Mantorville, and the Biesanz Stone Co. and George Haun Stone Co., Winona, also furnish architectural building stone.

Missouri.—The stone quarried at Carthage, Jasper County, Mo., used for architectural building and monumental stone is classed as marble, and is included in the figures of production of marble in Missouri given on page 224. Its chief use is, however, as is that of the Indiana stone, mainly for exterior building, and the figures of production are given here for convenience in comparison. The crushed stone and low-grade material are included under limestone, but all grades are combined to show the total production.

In March, 1927, there was a consolidation of the principal quarrying companies producing dimension stone; the name of the producing company is now the Carthage Marble Corporation, Carthage. The crushing plants are operated independently.

Limestone and marble sold by producers in the Carthage district, Jasper County, Mo., 1918–1927

Year	Building stone (rough and dressed)		Monumental stone (rough and dressed)		Other		Total	
	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1918	236, 885	$239, 418	26, 387	$31, 798	[1] 48, 000	$68, 682	[1] 70, 820	$339, 898
1919	231, 573	399, 381	62, 482	77, 117	44, 817	84, 025	69, 500	560, 523
1920	295, 341	589, 213	86, 791	158, 440	56, 292	190, 529	129, 700	938, 182
1921	279, 560	587, 301	31, 551	77, 421	46, 751	152, 521	72, 600	817, 243
1922	368, 400	692, 693	26, 330	40, 471	68, 550	176, 852	102, 300	910, 016
1923	442, 680	782, 796	20, 630	32, 243	66, 070	167, 357	104, 760	982, 396
1924	435, 810	826, 294	25, 660	40, 505	78, 030	193, 944	116, 560	1, 060, 743
1925	478, 210	1, 012, 930	38, 810	85, 321	224, 270	304, 913	267, 450	1, 403, 164
1926	426, 950	975, 754	32, 630	80, 698	127, 330	220, 780	165, 700	1, 277, 232
1927	339, 260	724, 265	10, 740	17, 429	93, 480	151, 795	122, 710	893, 489

[1] Estimated.

SANDSTONE

There was an increase of 1 per cent in quantity and a decrease of 2 per cent in value of sandstone in 1927. Sandstone for building, paving blocks, curbing, riprap, and miscellaneous uses increased in quantity, and that for flagging, crushed stone, refractory stone (ganister), and rubble decreased.

Sandstone sold or used by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building stone cubic feet	3, 346, 550	$3, 154, 207	3, 995, 370	$3, 025, 864
Approximate equivalent in short tons	249, 360		300, 390	
Paving blocks number	2, 315, 180	171, 275	2, 755, 770	215, 222
Approximate equivalent in short tons	25, 450		32, 510	
Curbing cubic feet	2, 085, 570	1, 780, 080	2, 570, 530	2, 199, 878
Approximate equivalent in short tons	154, 520		188, 430	
Flagging cubic feet	854, 424	642, 469	737, 680	573, 736
Approximate equivalent in short tons	62, 600		55, 160	
Crushed stone short tons	2, 835, 010	3, 300, 859	2, 832, 230	2, 910, 441
Rubble do	52, 450	91, 678	29, 370	43, 590
Riprap do	571, 280	592, 844	649, 410	664, 635
Refractory stone (ganister) do	984, 470	1, 321, 824	900, 720	1, 164, 768
Other uses do	43, 390	93, 793	62, 380	124, 901
Total (quantities approximate, in short tons)	4, 978, 530	11, 149, 029	5, 050, 600	10, 923, 035

Sandstone sold or used by producers in the United States, 1926 and 1927, by States

[Quantities approximate]

State	1926		1927	
	Short tons	Value	Short tons	Value
Alabama	49,530	$59,882	37,240	$47,150
Arizona	(1)	(1)	(1)	(1)
Arkansas	35,360	47,605	----------	----------
California	865,010	926,217	877,290	937,450
Colorado	46,470	71,085	52,470	77,004
Connecticut	17,180	17,126	19,960	41,880
Georgia	----------	----------	(1)	(1)
Idaho	29,970	124,350	(1)	(1)
Illinois	(1)	(1)	49,260	32,420
Indiana	21,000	29,190	9,140	12,383
Kansas	(1)	(1)	13,680	27,502
Kentucky	31,640	119,957	177,520	248,157
Louisiana	2,580	9,410	----------	----------
Massachusetts	(1)	(1)	(1)	(1)
Michigan	(1)	(1)	(1)	(1)
Minnesota	59,580	122,842	66,280	118,222
Montana	49,160	31,218	6,870	13,734
New Jersey	(1)	(1)	(1)	(1)
New Mexico	(1)	(1)	(1)	(1)
New York	[2] 144,700	[2] 1,171,885	[2] 99,600	[2] 1,104,519
Ohio	386,970	3,087,471	504,790	3,762,847
Oklahoma	(1)	(1)	(1)	(1)
Oregon	374,300	363,294	345,200	346,499
Pennsylvania	[2] 1,502,490	[2] 2,625,730	[2] 1,484,580	[2] 2,439,067
South Dakota	133,530	196,231	210,500	275,615
Tennessee	(1)	(1)	3,530	13,967
Texas	65,200	69,450	24,000	36,000
Utah	(1)	(1)	104,030	110,632
Virginia	126,510	157,444	87,120	157,568
Washington	13,730	455,045	3,300	160,859
West Virginia	182,500	388,890	62,670	85,947
Wisconsin	254,460	523,564	261,270	434,582
Wyoming	5,720	11,080	----------	----------
Undistributed	580,940	540,063	550,300	439,031
	4,978,530	11,149,029	5,050,600	10,923,035

[1] Included under "Undistributed."

[2] Includes bluestone.

Sandstone sold or used by producers in the United States in 1927, by States and uses

State	Number of active plants	Building						Refractory stone (ganister)		Paving blocks		Curbing	
		Rough construction		Rough architectural		Dressed (sawed and cut)							
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Number	Value	Cubic feet	Value
Alabama	4							(1)	(1)				
Arizona	1							(1)	(1)				
California	15			(1)	(1)			(1)	(1)				
Colorado	13	(1)	(1)	(1)	(1)	(1)	(1)	22,490	$33,091				
Connecticut	4	3,720	$5,677	(1)	(1)	(1)	(1)						
Georgia	1							(1)	(1)				
Idaho	1	(1)	(1)			(1)	(1)						
Illinois	3							1,590	4,922				
Indiana	1												
Kansas	2												
Kentucky	5					66,080	$74,018						
Massachusetts	2	(1)	(1)	(1)	(1)	(1)	(1)						
Michigan	2			(1)	(1)								
Minnesota	6			3,660	$3,670	2,240	1,813	(1)	(1)	(1)	(1)		
Montana	2							6,870	13,734				
New Jersey	2	(1)	(1)	(1)	(1)								
New Mexico	1												
New York	40	5,000	8,918	52,870	29,199	105,860	243,777			511,420	$32,594	539,530	$647,750
Ohio	15	27,040	47,362	550,350	303,680	1,086,360	1,457,239	5,490	14,453			1,887,000	1,416,930
Oklahoma	1	(1)	(1)										
Oregon	2												
Pennsylvania	87	40,870	66,525	120,590	86,566	24,100	109,301	601,820	760,509	2,168,440	172,318	144,000	135,198
South Dakota	6	(1)	(1)			(1)	(1)	16,110	17,790				
Tennessee	4	2,540	7,562										
Texas	1												
Utah	21												
Virginia	3	(1)	(1)	(1)	(1)	(1)	(1)						
Washington	3	(1)	(1)			(1)	(1)						
West Virginia	14	(1)	(1)	(1)	(1)			3,920	3,475				
Wisconsin	18	3,290	5,759	37.910	43,445	6,220	22,734	183,740	233,498	(1)	(1)		
Undistributed		54,280	74,134	109,710	121,517	86,250	312,968	58,690	83,296	75,910	10,310		
	280	136,740	215,937	875,090	588,077	1,377,110	2,221,850	900,720	1,164,768	2,755,770	215,222	2,570,530	2,199,878

State	Flagging		Rubble		Riprap		Crushed stone				Other uses		Total	
							Concrete and road metal		Railroad ballast					
	Cubic feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Alabama	----	----	[1]	[1]	----	----	----	----	----	----	----	----	37, 240	$47, 150
Arizona	----	----	----	----	----	----	----	----	----	----	----	----	[1]	[1]
California	----	----	----	----	94, 710	$123, 279	726, 680	$736, 182	[1]	[1]	29, 180	$7, 706	877, 290	937, 450
Colorado	[1]	[1]	2, 360	$4, 479	11, 060	13, 559	10, 220	16, 676	----	----	5, 170	3, 564	52, 470	77, 004
Connecticut	----	----	----	----	[1]	[1]	[1]	[1]	----	----	----	----	19, 960	41, 880
Georgia	----	----	----	----	----	----	----	----	----	----	----	----	[1]	[1]
Idaho	[1]	[1]	----	----	----	----	----	----	----	----	----	----	[1]	[1]
Illinois	----	----	----	----	----	----	47, 670	27, 498	----	----	----	----	49, 260	32, 420
Indiana	----	----	9, 140	12, 383	----	----	----	----	----	----	----	----	9, 140	12, 383
Kansas	7, 440	$3, 927	----	----	----	----	13, 100	23, 575	----	----	----	----	13, 680	27, 502
Kentucky	14, 300	12, 983	560	557	690	346	42, 270	87, 625	127, 250	$72, 628	----	----	177, 520	248, 157
Massachusetts	----	----	----	----	----	----	----	----	----	----	----	----	[1]	[1]
Michigan	----	----	----	----	[1]	[1]	[1]	[1]	----	----	----	----	[1]	[1]
Minnesota	770	278	[1]	[1]	----	----	60, 280	83, 628	----	----	2, 990	20, 884	66, 280	118, 222
Montana	----	----	----	----	----	----	----	----	----	----	----	----	6, 870	13, 734
New Jersey	----	----	----	----	----	----	----	----	----	----	----	----	[1]	[1]
New Mexico	----	----	----	----	----	----	[1]	[1]	[1]	[1]	----	----	[1]	[1]
New York	131, 620	103, 844	100	200	4, 660	3, 759	16, 340	34, 478	----	----	----	----	99, 600	1, 104, 519
Ohio	482, 150	345, 758	890	2, 255	157, 410	137, 387	31, 430	31, 805	----	----	2, 100	5, 978	504, 790	3, 762, 847
Oklahoma	----	----	----	----	----	----	----	----	----	----	----	----	[1]	[1]
Oregon	----	----	----	----	340, 000	340, 000	5, 200	6, 499	----	----	----	----	345, 200	346, 499
Pennsylvania	90, 220	98, 871	4, 410	11, 516	21, 150	21, 155	486, 680	636, 784	266, 040	331, 500	5, 890	8, 824	1, 484, 580	2, 439, 067
South Dakota	----	----	----	----	[1]	[1]	191, 520	242, 755	----	----	----	----	210, 500	275, 615
Tennessee	4, 250	3, 900	450	105	----	----	----	----	----	----	200	2, 400	3, 530	13, 967
Texas	----	----	----	----	14, 000	21, 000	10, 000	15, 000	----	----	----	----	24, 000	36, 000
Utah	----	----	----	----	----	----	95, 360	95, 468	----	----	8, 670	15, 164	104, 030	110, 632
Virginia	----	----	170	337	----	----	2, 000	4, 000	81, 000	42, 133	----	----	87, 120	157, 568
Washington	----	----	----	----	----	----	----	----	----	----	----	----	3, 300	160, 859
West Virginia	----	----	[1]	[1]	----	----	[1]	[1]	----	----	----	----	62, 670	85, 947
Wisconsin	2, 560	200	[1]	[1]	3, 060	2, 155	54, 890	57, 321	----	----	8, 180	60, 381	261, 270	434, 582
Undistributed	4, 370	3, 975	11, 290	11, 758	2, 670	1, 995	202, 670	125, 572	361, 630	239, 314	----	----	550, 300	439, 031
	737, 680	573, 736	29, 370	43, 590	649, 410	664, 635	1, 996, 310	2, 224, 866	835, 920	685, 575	62, 380	124, 901	5, 050, 600	10, 923, 035

[1] Included under "Undistributed."

BLUESTONE

The figures for bluestone are included in those for sandstone, but on account of the local importance of this stone they are also given separately. Except for a few of the large quarries, the Bureau of Mines uses the figures of sales reported by dealers, rather than those of the quarrymen, as more nearly representative of this industry.

Bluestone sold in New York and Pennsylvania, 1926 and 1927

State	Building stone		Curbing		Flagging		Other		Total	
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1926										
New York	129,890	$249,308	277,520	$357,047	110,940	$94,885	17,600	$26,953	61,390	$728,193
Pennsylvania	11,800	11,847	91,310	92,498	71,180	80,012	5,500	844	20,220	185,201
	141,690	261,155	368,830	449,545	182,120	174,897	23,100	27,797	81,610	913,394
1927										
New York	142,980	258,526	353,440	434,206	127,720	100,844	7,650	5,639	62,330	799,215
Pennsylvania	10,070	9,362	97,670	101,299	83,850	95,980	4,120	2,387	20,310	209,028
	153,050	267,888	451,110	535,505	211,570	196,824	11,770	8,026	82,640	1,008,243

MISCELLANEOUS STONE

The material included under "miscellaneous" stone is mainly for road metal, concrete, and railroad ballast. Because of the nature and irregularity of production of the materials in this classification, the output is apt to vary greatly. There was a large increase in the quantity reported in 1927 and a smaller increase in value.

The State contributing the largest amount of miscellaneous stone is California. The output of this State includes rhyolite tuff (used as a building stone), andesite, rhyolite, trachyte, and other light-colored volcanic rocks, decomposed granite, hornblende-mica schist, and stone crushed from bowlders taken from river beds. The crushed bowlders are mostly from Los Angeles County, where part of the material taken out is sand, part screened gravel, and the rest chiefly bowlders which are crushed. The sand and screened gravel obtained are included in the report of this series on sand and gravel. Among the varieties of stone reported are argillite quarried in Arkansas, New Jersey, and Pennsylvania; phonolite from mine dumps in Colorado; cherty limestone or flint rock in Florida; rhyolite in Missouri; slate, conglomerate, and light-colored volcanic rocks in Massachusetts; and mica schist for building and refractory stone in Pennsylvania. There are also included from the other States volcanic cinders, coral rock, rhyolite, andesite, decomposed granite, mica crystal grit, serpentine, field stone, and some stone of unknown kinds reported by local contractors or operators of portable crushers at temporary quarry sites.

Miscellaneous varieties of stone[1] sold or used by producers in the United States, 1926 and 1927, by uses

Use	1926		1927	
	Quantity	Value	Quantity	Value
Building stone……cubic feet	196, 930	$42, 488	1, 270, 520	$304, 597
Approximate equivalent in short tons	16, 570	----------	107, 450	----------
Riprap and rubble……short tons	245, 020	633, 140	9, 220	5, 683
Crushed stone……do	4, 450, 150	4, 893, 979	6, 933, 030	6, 425, 940
Refractory stone (mica schist)……do	35, 300	145, 206	28, 040	121, 800
Other uses……do	11, 590	30, 144	37, 150	113, 316
Total (quantities approximate, in short tons)	4, 758, 630	5, 744, 957	7, 114, 890	6, 971, 336

[1] Includes mica schist, conglomerate, argillite, various light-colored volcanic rocks, serpentine not used as marble, and such other stone as can not be properly classed in any of the main groups.

Miscellaneous varieties of stone sold or used by producers in the United States, 1926 and 1927, by States

[Quantities approximate]

State	1926		1927	
	Short tons	Value	Short tons	Value
Arizona	32, 000	$42, 167	----------	----------
Arkansas	(1)	(1)	348, 860	$368, 339
California	3, 175, 680	3, 612, 385	4, 682, 320	4, 118, 582
Colorado	93, 370	49, 162	149, 850	37, 616
Florida	212, 560	233, 941	300, 350	242, 910
Idaho	5, 000	7, 500	(1)	(1)
Maine	26, 000	55, 800	7, 820	16, 530
Maryland	----------	----------	(1)	(1)
Massachusetts	235, 150	346, 404	371, 080	744, 410
Missouri	27, 520	57, 165	(1)	(1)
Montana	16, 650	10, 797	(1)	(1)
Nevada	40, 110	56, 283	653, 590	499, 678
New Hampshire	----------	----------	(1)	(1)
New Jersey	(1)	(1)	(1)	(1)
New York	(1)	(1)	----------	----------
North Carolina	(1)	(1)	141, 430	142, 850
Ohio	----------	----------	(1)	(1)
Oregon	(1)	(1)	33, 990	19, 117
Pennsylvania	133, 470	323, 323	186, 670	400, 744
Rhode Island	197, 660	346, 463	75, 620	159, 935
South Dakota	3, 410	3, 885	17, 190	10, 188
Texas	----------	----------	(1)	(1)
Utah	57, 560	29, 206	7, 810	17, 243
Virginia	76, 880	119, 383	45, 470	45, 470
Washington	11, 700	11, 700	4, 090	3, 670
Undistributed	413, 910	439, 393	88, 750	144, 054
	4, 758, 630	5, 744, 957	7, 114, 890	6, 971, 336

[1] Included under "Undistributed."

Miscellaneous varieties of stone sold or used by producers in the United States in 1927, by States and uses

State	Number of active plants	Building		Riprap and rubble		Crushed stone				Other uses		Total	
						Concrete and road metal		Railroad ballast					
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Arkansas	4	(1)	(1)	(1)	(1)	169,430	$227,397	178,730	$139,943			348,860	$368,339
California	73	(1)	(1)	(1)	(1)	4,470,060	3,820,159	130,780	75,423	20,170	$40,772	4,682,320	4,118,582
Colorado	3					72,100	16,204	77,750	21,412			149,850	37,616
Florida	4					300,350	242,910					300,350	242,910
Idaho	1	(1)	(1)									(1)	(1)
Maine	3					7,820	16,530					7,820	16,530
Maryland	1					(1)	(1)					(1)	(1)
Massachusetts	13	(1)	(1)			334,180	675,920	(1)	(1)	(1)	(1)	371,080	744,410
Missouri	1					(1)	(1)					(1)	(1)
Montana	1					(1)	(1)					(1)	(1)
Nevada	13			(1)	(1)	355,600	340,180	(1)	(1)	(1)	(1)	653,590	499,678
New Hampshire	1					(1)	(1)			(1)	(1)	(1)	(1)
New Jersey	1	(1)	(1)			(1)	(1)					(1)	(1)
North Carolina	2			800	$1,600	133,630	134,000	7,000	7,250			141,430	142,850
Ohio	1									(1)	(1)	(1)	(1)
Oregon	4					33,990	19,117					33,990	19,117
Pennsylvania	23	32,560	$76,356			111,360	165,807	8,800	13,177	33,950	145,404	186,670	400,744
Rhode Island	8					75,620	159,935					75,620	159,935
South Dakota	4					17,190	10,188					17,190	10,188
Texas	1									(1)	(1)	(1)	(1)
Utah	7					(1)	(1)			(1)	(1)	7,810	17,243
Virginia	1					45,470	45,470					45,470	45,470
Washington	1					4,090	3,670					4,090	3,670
Undistributed		74,890	228,241	8,420	4,083	79,300	75,926	319,780	215,322	11,070	48,940	88,750	144,054
	171	107,450	304,597	9,220	5,683	6,210,190	5,953,413	722,840	472,527	65,190	235,116	7,114,890	6,971,336

[1] Included under "Undistributed."

CRUSHED STONE (CONCRETE AND ROAD METAL AND RAILROAD BALLAST)

The crushed stone sold or used by producers for concrete and road metal and for railroad ballast in the United States increased 15 per cent in quantity and 11 per cent in value in 1927 as compared with 1926. Stone for concrete and road metal increased 17 per cent in quantity and 12 per cent in value. Stone for railroad ballast increased 5 per cent in quantity and 4 per cent in value. For 1927, as for the four years preceding, a canvass was made of railroad companies in order to obtain more complete reports of the noncommercial material quarried and used by them. A similar canvass was made of the highway departments of all the States to ascertain the amount of noncommercial material used by them. The reports, except those from a few States, are not entirely satisfactory; records are not kept by all States in such a way as to give this information. There are also great variations in the output reported by States and municipalities, because much of the State and municipal work depends on appropriations that vary greatly from year to year.

Crushed stone sold or used by producers in the United States, 1926 and 1927

Kind	Concrete and road metal		Railroad ballast		Total		
	Short tons	Value	Short tons	Value	Short tons	Value	
						Total	Average
1926							
Granite	5,200,480	$6,593,135	1,268,620	$866,004	6,469,100	$7,459,139	$1.15
Basalt and related rocks (trap rock)	10,271,700	12,423,852	2,222,560	2,358,006	12,494,260	14,781,858	1.18
Limestone	45,237,350	48,650,616	11,029,690	8,785,563	56,267,040	57,436,179	1.02
Sandstone	2,124,870	2,818,748	710,140	482,111	2,835,010	3,300,859	1.16
Miscellaneous	4,058,130	4,563,579	392,020	330,400	4,450,150	4,893,979	1.10
	66,892,530	75,049,930	15,623,030	12,822,084	82,515,560	87,872,014	------
Average value per ton	------	1.12	------	0.82	------	1.06	------
1927							
Granite	5,822,810	7,785,512	1,594,050	1,108,689	7,416,860	8,894,201	1.20
Basalt and related rocks (trap rock)	10,764,770	13,574,471	1,921,480	2,257,749	12,686,250	15,832,220	1.25
Limestone	53,750,130	54,638,975	11,330,270	8,772,490	65,080,400	63,411,465	.97
Sandstone	1,996,310	2,224,866	835,920	685,575	2,832,230	2,910,441	1.03
Miscellaneous	6,210,190	5,953,413	722,840	472,527	6,933,030	6,425,940	.93
	78,544,210	84,177,237	16,404,560	13,297,030	94,948,770	97,474,267	------
Average value per ton	------	1.07	------	0.81	------	1.03	------

BARITE AND BARIUM PRODUCTS

By R. M. SANTMYERS[1]

INTRODUCTION

The barite industry in the United States apparently prospered during 1927, as sales of almost all of the products showed an advance over the previous year. Business followed well-defined lines; the consuming manufacturers in most instances placed contracts covering their year's requirements early in the year, and withdrawals against these contracts furnished most of the year's activity. Quotations for all barium products were well maintained. The general price level at the end of the year was slightly under that prevailing at the end of the previous year.

CRUDE BARITE

SALES

The quantity of crude barite sold or used by producers during 1927 was the largest ever recorded, exceeding that of 1926 by 16,390 tons, or 7 per cent. The average value of sales in 1927, however, was the lowest since the war years ($6.57 per ton f. o. b. mine in 1927 as compared with $7.45 in 1926).

Crude barite sold or used by producers in the United States, 1918–1927

Year	Short tons	Value f. o. b. at mine		Year	Short tons	Value f. o. b. at mine	
		Total	Average			Total	Average
1918	155, 368	$1, 044, 905	$6. 73	1923	214, 183	$1, 664, 156	$7. 77
1919	209, 330	1, 727, 822	8. 25	1924	196, 332	1, 540, 744	7. 85
1920	228, 113	2, 142, 464	9. 39	1925	228, 063	1, 703, 097	7. 47
1921	66, 369	531, 958	8. 02	1926	237, 875	1, 773, 293	7. 45
1922	155, 040	1, 123, 950	7. 25	1927	254, 265	1, 670, 878	6. 57

Georgia showed a favorable increase in sales of crude barite, advancing from 33 per cent of the total in 1926 to 37 per cent in 1927; the average value of sales, however, dropped from $6.86 per ton f. o. b. mine in 1926 to $6.17 in 1927. It is reported that this increase in output was due to a large extent to the inability of the German barite producers to make prompt shipments to consumers along the Atlantic seaboard. Missouri and Tennessee showed declines from the previous year in both quantity and value. Missouri furnished 44 per cent of total in 1927 as compared with 50 per cent in 1926, and Tennessee 8 per cent as compared with 9 per cent for the previous year. The average values per ton f. o. b. mine were $7.15 in 1927 and $7.96 in 1926 in Missouri, and $6.33 and $7.45, respectively, in Tennessee.

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[1] Figures on domestic production compiled by B. H. Stoddard, and those on imports and exports compiled from records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, both of the Bureau of Mines.

Crude barite sold or used by producers in the United States, 1926 and 1927, by States

State	1926				1927			
	Short tons	Percentage of total	Value f. o. b. at mine		Short tons	Percentage of total	Value f. o. b. at mine	
			Total	Average			Total	Average
California	(1)	(1)	(1)	(1)	13,919	6	$71,708	$5.15
Georgia	77,654	33	$532,706	$6.86	94,039	37	580,300	6.17
Missouri	118,919	50	946,595	7.96	111,456	44	797,465	7.15
Nevada	(1)	(1)	(1)	(1)	884	--------	3,969	4.49
Tennessee	20,910	9	155,780	7.45	20,537	8	129,999	6.33
Other States [2]	20,392	8	138,212	6.78	13,430	5	87,437	6.51
	237,875	100	1,773,293	7.45	254,265	100	1,670,878	6.57

[1] Included under "Other States."

[2] 1926: Arizona, California, Illinois, Kentucky, Nevada, South Carolina, Virginia, and Wisconsin; 1927: South Carolina, Virginia, and Wisconsin.

STOCKS

The apparent stock of crude barite on hand at the mines at the end of December, 1927, was about 37,000 short tons, 20,000 tons of which was held in Georgia, 15,000 tons in Missouri, and the remainder in California, Illinois, Tennessee, Wisconsin, and Virginia. These stocks do not include the crude barite held at the chemical, lithopone, and grinders' plants, as such lots are considered marketed product and are included in the sales of crude barite.

CONSUMPTION BY USES

Twenty-four plants distributed in 11 States used 330,190 short tons of domestic and imported crude barite in 1927. Missouri, with 3 plants, used 69,874 tons for the manufacture of ground barite and barium chemicals; New Jersey, with 3 plants, used 49,184 tons for the manufacture of lithopone and chemicals; Pennsylvania, with 3 plants, used 42,130 tons for the manufacture of lithopone and chemicals; and Illinois, with 6 plants, used 64,626 tons in the production of lithopone and chemicals. Most of the imported crude barite was used in the Atlantic Coast States—New Jersey, Pennsylvania, Delaware, Maryland, and New York.

Crude barite (both domestic and imported) used in the manufacture of barium products in the United States, 1918–1927, in short tons

Year	In manufacture of—			Total	Year	In manufacture of—			Total
	Ground barite	Lithopone	Barium chemicals			Ground barite	Lithopone	Barium chemicals	
1918	62, 440	85, 282	38, 041	185, 763	1923	47, 713	128, 547	34, 327	210, 587
1919	64, 922	103, 688	32, 976	201, 586	1924	42, 855	137, 127	33, 181	213, 163
1920	79, 052	113, 181	37, 210	229, 443	1925	56, 851	146, 693	29, 141	232, 685
1921	28, 296	61, 359	10, 952	100, 607	1926	69, 048	178, 889	33, 119	281, 056
1922	48, 280	94, 259	25, 303	167, 842	1927	73, 119	222, 791	34, 280	330, 190

Domestic and imported crude barite used in the manufacture of barium products in the United States in 1927, by States

State	Product manufactured	Plants [1]	Barite used
			Short tons
Illinois	Lithopone and chemicals	6	64, 626
Missouri	Ground barite and chemicals	3	69, 874
New Jersey	Lithopone and chemicals	3	49, 184
Pennsylvania	do	3	42, 130
California	Ground barite, lithopone, and chemicals	3	8, 313
Delaware and Maryland	Lithopone	2	96, 063
Georgia	Ground barite	1	
New York	Chemicals	1	
South Carolina	Ground barite	1	
West Virginia	Chemicals	1	
		24	330, 190

[1] A plant producing more than one product is counted but once in arriving at total.

IMPORTS

Imports of barite from Germany still play an important rôle in the American barite industry, furnishing the Atlantic Coast States with a large part of their requirements. The total amount of crude barite imported for consumption during 1927 was 70,274 short tons, valued at $253,284, or an average of $3.60 per ton. As compared with the preceding year, these imports represent an increase of 19,258 tons in quantity and $58,280 in value, but a decrease in average value per ton from $3.82 in 1926 to $3.60 in 1927. Germany furnished 66,050 tons, valued at $223,657 or $3.39 per ton. The remainder, 4,224 tons, valued at $29,627, or $7.01 per ton, was recorded as imported from the Netherlands; it was probably, however, of German origin.

Crude barite imported for consumption in the United States, 1918–1927

Year	Short tons	Value [1]		Year	Short tons	Value [1]	
		Total	Average			Total	Average
1918				1923	15, 045	$93, 721	$6. 23
1919	118	$594	$5. 03	1924	21, 502	104, 264	4. 85
1920	24, 874	146, 858	5. 90	1925	28, 655	91, 016	3. 18
1921	11, 054	59, 371	5. 37	1926	51, 016	195, 004	3. 82
1922	23, 239	104, 680	4. 50	1927	70, 274	253, 284	3. 60

[1] Value at port of shipment, on which duty is levied. Does not include railroad and ship freight charges to this country or import duty.

WORLD PRODUCTION

The following table shows the output of barite by various countries from 1923 to 1927, so far as statistics are available.

World production of barite, 1923–1927, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
Algeria	700	500	600	800	500
Australia:					
New South Wales	102	152	203	203	203
South Australia	1, 789	1, 928	2, 040	1, 770	1, 916
Austria	2, 377	1, 399	1, 363	966	1, 924
Belgium	6, 770	20, 490	13, 190	6, 100	(1)
Canada	371	137	86	91	51
France	26, 061	44, 189	41, 450	(1)	(1)
Germany:					
Bavaria	19, 970	23, 029	21, 477	26, 955	20, 035
Prussia	97, 207	102, 326	151, 243	135, 319	154, 794
Saxony	----------	2, 076	968	----------	(1)
Great Britain	44, 195	55, 646	49, 462	43, 462	47, 605
India (British)	2, 611	2, 340	1, 473	2, 348	1, 747
Italy	27, 592	39, 568	32, 195	31, 845	30, 677
Japan	47	----------	----------	----------	(1)
Rhodesia, Southern	9	64	36	27	13
Russia [2]	60	737	4, 684	14, 389	(1)
Spain [3]	18, 434	14, 450	8, 784	7, 941	7, 716
United States	194, 303	178, 108	206, 894	215, 795	230, 664

[1] Data not available.

[2] Data for year ended Sept. 30.

[3] Includes the following quantities reported produced from quarries: 1923, 6,670 tons; 1924, 7,682 tons; 1925, 78 tons; 1926, 690 tons; 1927, 2,760 tons.

BARIUM PRODUCTS

The total quantity of barium products manufactured and sold in 1927 was 8 per cent larger than in 1926; the total value increased 7 per cent. Barium chemicals showed a gain in quantity of 9 per cent over 1926 and lithopone 11 per cent; sales of ground barite decreased slightly. Business, on the whole, was very good, and though prices were lower than those prevailing during the preceding year, the decrease was gradual and had little effect on the volume of sales.

Barium products made from domestic and imported crude ores in the United States and sold, 1926–27

Product	1926			1927		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Ground barite	57, 812	$1, 186, 563	$20. 52	57, 658	$1, 166, 294	$20. 23
Lithopone	159, 931	16, 062, 197	100. 43	176, 994	17, 163, 620	96. 97
Barium chemicals [1]	21, 911	1, 325, 262	----------	23, 943	1, 517, 994	----------
	239, 654	18, 574, 022	----------	258, 595	19, 847, 908	----------

[1] Barium chemicals manufactured from barium products bought in open market are not included in table in order to avoid duplication; the total output of barium chemicals is therefore not shown above.

REFINED GROUND BARITE

Missouri continued to be the center of the barite grinding industry, using 62,463 tons of crude barite for this purpose in 1927. The total crude barite so used in 1927 was 73,119 tons, an increase of 4,071 tons over the preceding year. Sales of ground barite by producers during 1927 amounted to 57,658 short tons, valued at $1,166,294, a decrease of 0.3 per cent in quantity and 2 per cent in value as compared with 1926. The average value per ton was $20.23 in 1927, as compared with $20.52 in 1926.

Ground barite sold by producers in the United States, 1918–1927

Year	Number of plants	Short tons	Value		Year	Number of plants	Short tons	Value	
			Total	Average				Total	Average
1918	9	55,086	$1,041,608	$18.91	1923	6	39,605	$895,095	$22.60
1919	9	[1] 57,985	[1] 1,163,437	20.06	1924	5	38,296	784,881	20.50
1920	8	65,748	1,381,868	21.02	1925	5	49,674	1,040,461	20.95
1921	7	27,661	622,871	22.52	1926	5	57,812	1,186,563	20.52
1922	7	46,176	933,722	20.22	1927	7	57,658	1,166,294	20.23

[1] Figures cover production, not sales.

LITHOPONE

Although the price of lithopone in 1927 was the lowest recorded in recent years, the quantity sold by the 13 plants producing in the United States was the largest in the history of the industry, exceeding that of 1926 by 11 per cent. The value of the sales increased from $16,062,197 in 1926 to $17,163,620 in 1927, or 7 per cent. The average value per ton decreased from $100.43 in 1926 to $96.97 in 1927, or 3 per cent.

Lithopone sold by producers in the United States, 1918–1927

Year	Number of plants	Short tons	Value		Year	Number of plants	Short tons	Value	
			Total	Average				Total	Average
1918	11	62,403	$7,923,276	$126.97	1923	11	98,199	$11,608,443	$118.21
1919	15	78,365	10,218,850	130.40	1924	11	109,469	12,531,397	114.47
1920	17	89,373	12,484,925	139.69	1925	11	145,019	15,186,147	104.72
1921	15	55,016	6,681,563	121.45	1926	13	159,931	16,062,197	100.43
1922	13	83,360	9,214,040	110.53	1927	13	176,994	17,163,620	96.97

GROWTH OF THE USE OF BARIUM PIGMENTS

The use of barium sulphate for the manufacture of lithopone, a white paint pigment consisting of a mixture of approximately 70 per cent of barium sulphate and 30 per cent of zinc sulphide, is increasing rapidly. In 1918 the producers sold 62,403 short tons of lithopone. The amount sold annually increased steadily until 1921, when, as a result of depressed business conditions throughout the country, the sales of lithopone fell to 55,016 tons. Since then sales have advanced steadily until 1927, when nearly 177,000 tons of lithopone was sold. Sales of barium sulphate (blanc fixe) have increased from 9,522 tons in 1918 to 13,395 tons in 1927.

The other principal pigments, those manufactured from lead and zinc, have not paralleled the growth of barium pigments in recent years. With the exception of the sharp decline in 1920 and 1921, the sales of zinc white pigments have been increasing, although not as rapidly as barium pigments. On the other hand, sales of lead white pigments increased from about 110,000 tons in 1918 to over 200,000 tons in 1922 but fell off thereafter and amounted to about 171,000 tons in 1927.

The following table shows the trend in the sales of barium, lead, and zinc pigments for 1918 to 1927.

Barium, lead, and zinc pigments sold by producers in the United States, 1918–1927, in short tons

Year	Lithopone	Barium sulphate (blanc fixe)	Lead pigments [1]	Zinc pigments [2]
1918	62, 403	9, 522	110, 291	127, 000
1919	78, 365	5, 227	148, 158	145, 230
1920	89, 373	8, 046	158, 107	129, 904
1921	55, 016	2, 471	181, 851	90, 432
1922	83, 360	7, 349	208, 756	148, 078
1923	98, 199	6, 761	174, 822	150, 491
1924	109, 469	7, 796	202, 066	158, 199
1925	145, 019	11, 748	178, 901	183, 104
1926	159, 931	(3)	162, 084	170, 782
1927	176, 994	13, 395	171, 177	177, 310

[1] White lead (dry and in oil) and white lead sulphate.
[2] Zinc oxide and leaded zinc oxide.
[3] Bureau of Mines not at liberty to publish figures.

BARIUM CHEMICALS

In 1927 the total sales of barium chemicals produced from barite increased 9 per cent over those of 1926. The value of the sales increased from $1,325,262 in 1926 to $1,517,994 in 1927, or about 15 per cent. Sales of barium carbonate increased from 5,394 tons, valued at $298,121, in 1926 to 5,969 tons, valued at $313,613, in 1927. The average value per ton, however, showed a decrease from $55.27 in 1926 to $52.54 in 1927, or 5 per cent. Sales of barium chloride decreased 19 per cent in quantity and 24 per cent in value, while the average value per ton decreased 5 per cent. Barium sulphate (blanc fixe) showed a marked increase in quantity and value and in the average value per ton.

Barium chemicals sold by producers in the United States, 1926 and 1927

Chemical	1926			1927		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Barium carbonate	5, 394	$298, 121	$55. 27	5, 969	$313, 613	$52. 54
Barium chloride	4, 592	279, 510	60. 87	3, 708	213, 446	57. 56
Barium sulphate (blanc fixe)	11, 925	747, 631	62. 69	13, 395	876, 842	65. 46
Other [1]				871	114, 093	131. 00
	21, 911	1, 325, 262		23, 943	1, 517, 994	

[1] 1926: Hydroxide and sulphide; 1927: Binoxide, hydroxide, and sulphide.

Barium chemicals sold by producers in the United States, 1918–1927, in short tons

Year	Barium carbonate	Barium chloride	Barium sulphate (blanc fixe)	Other barium chemicals[1]	Year	Barium carbonate	Barium chloride	Barium sulphate (blanc fixe)	Other barium chemicals[1]
1918	7,661	4. 530	9,522	1. 473	1923	6,362	3,301	6,761	379
1919[2]	7,135	4,509	5,227	3,142	1924	6,058	3,859	7,796	441
1920	7,484	3,084	8,046	2,146	1925	4,962	(3)	11,748	1,944
1921	1,956	(3)	2,471	1,060	1926	5,394	4,592	(3)	11,925
1922	2,281	2,022	7,349	2,249	1927	5. 969	3,708	13,395	871

[1] Figures cover chemicals, as follows—1918 and 1920: Binoxide, hydroxide, nitrate. and sulphide; 1919: Binoxide, nitrate, and sulphide; 1921 and 1925: Chloride, hydroxide, and sulphide; 1922: Binoxide, hydroxide, sulphide, and sulphydrate; 1923-24: Hydroxide and sulphide; 1926: Hydroxide, sulphate, and sulphide; 1927: Binoxide, hydroxide, and sulphide.

[2] Figures cover production, not sales.

[3] Included under "Other barium chemicals."

IMPORTS AND EXPORTS

With the exception of barium nitrate, which increased 18 per cent in quantity and 32 per cent in value, all barium compounds imported for consumption in the United States in 1927 showed decreases in quantity from the previous year. The following are the compounds that showed decreases in both quantity and value: Ground barite, nearly 3 per cent in quantity and 14 per cent in value; lithopone, 8 per cent and 1 per cent; barium binoxide, 88 per cent and 85 per cent; barium sulphate (blanc fixe), 19 per cent and 22 per cent; artificial barium carbonate, 47 per cent and 37 per cent; natural barium carbonate (ground witherite), 2 per cent and 18 per cent; and barium chloride, 11 per cent and 8 per cent. Barium hydroxide imports decreased 6 per cent in quantity but increased 27 per cent in value.

The exports of lithopone in 1927 amounted to 2,110 tons, valued at $222,585, or $105.49 per ton, an increase of 9 per cent in quantity and 11 per cent in total value over 1926.

Barium compounds imported for consumption in the United States, 1921–1927

[Value at port of shipment]

Year	Ground barite			Lithopone			Barium binoxide		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per pound		Total	Average per pound
1921	1,002	$16,942	$16.91	5,247	$432. 019	$0.041	669	$127,631	$0.095
1922	4,696	59. 453	12.66	10,763	885,671	.041	1,009	189,334	.094
1923	6,022	88,741	14.74	10,440	776,383	.037	905	152,270	.084
1924	2,830	38,292	13.53	6,830	543,025	.040	860	120,374	.070
1925	3,203	40. 008	12.49	6,330	478,395	.038	635	70,553	.056
1926	3,347	44,781	13.38	8,686	661,700	.038	49	8,157	.083
1927	3,259	38,568	11.83	7,979	656,166	.041	6	1,264	.105

Barium compounds imported for consumption in the United States, 1921–1927—Continued

[Value at port of shipment]

Year	Blanc fixe (precipitated barium sulphate)			Artificial barium carbonate (chemically precipitated)			Natural barium carbonate (ground witherite)		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average per pound		Total	Average per pound		Total	Average per pound
1921	769	$22,470	$0.015	2,238	$80,603	$0.018	668	$25,188	$0.019
1922	2,187	76,445	.017	5,212	210,250	.020	1,472	39,114	.013
1923	587	32,063	.027	1,901	79,482	.021	1,557	41,823	.013
1924	1,047	50,465	.024	3,752	128,217	.017	2,500	56,415	.011
1925	1,996	81,439	.020	7,188	160,164	.011	2,390	63,634	.013
1926	2,973	136,697	.023	9,224	189,167	.010	3,380	80,679	.012
1927	2,400	107,179	.022	4,918	119,014	.012	3,300	65,821	.010

Year	Barium chloride			Barium nitrate			Barium hydroxide		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average per pound		Total	Average per pound		Total	Average per pound
1921	2,186	$72,621	$0.017	(1)	(1)	----------	(1)	(1)	----------
1922	1,962	112,785	.029	[2] 179	[2] $16,795	$0.047	[2] 73	[2] $6,573	$0.045
1923	1,278	75,014	.029	511	59,766	.058	181	16,872	.047
1924	2,330	100,810	.022	513	54,638	.053	174	8,241	.024
1925	2,167	67,306	.016	703	58,192	.041	120	5,605	.023
1926	1,773	49,426	.014	602	49,494	.041	236	9,789	.021
1927	1,577	45,285	.014	711	65,284	.046	222	12,439	.028

[1] Not separately recorded prior to the tariff of Sept. 22, 1922.
[2] Sept. 22 to Dec. 31.

Lithopone exported from the United States, 1922–1927 [1]

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1922	1,616	$169,982	$105.19	1925	1,287	$132,771	$103.16
1923	1,485	176,624	118.94	1926	1,941	200,412	103.25
1924	923	104,783	113.52	1927	2,110	222,585	105.49

[1] Not separately recorded prior to 1922.

MARKETS AND PRICES

Although the market for barite and barium products was comparatively even in tone during 1927, prices for most of the products were a little under those of the preceding year.

The lithopone business appeared to more than hold its own during 1927 in the quantity produced and sold. Prices were maintained throughout the year, and the market had become stable following the sharp competition during the closing half of 1926, which carried prices to lower levels. Manufacturers carried a heavy volume of contract business on their books throughout the year and were thus able to scale production to meet the consumptive needs of the industry.

The accompanying table gives the range of quotations on barite and the barium products, 1925 to 1927. Quotations on crude barite are taken from the Engineering and Mining Journal and represent prices in Missouri. Quotations on ground barite are taken from the Oil, Paint, and Drug Reporter and represent prices at St. Louis; quotations on lithopone and barium chemicals are taken from the same source and represent prices at New York.

Range of quotations on barite and barium products, 1925–1927

	Unit	1925	1926	1927
Crude barite	Short ton	$8.50	$8.00 –$8.50	$8.00
Ground barite	do	$22.00 –23.00	23.00	23.00
Lithopone	Pound	.06⅛– .06⅝	.05⅞– .06⅝	.05⅞
Barium carbonate	Short ton	54.00 –65.00	50.00 –55.00	$48.00 –54.00
Barium chlorate	Pound	.14 – .15	.14 – .15	.14 – .15
Barium chloride	Short ton	60.00 –72.50	60.00 –66.00	52.00 –65.00
Barium nitrate	Pound	.08 – .09	.07½– .09	.07½– .10
Barium sulphate (blanc fixe), dry	do	.04 – .05	.04 – .04½	.04¼– .04⅜
Barium sulphate (blanc fixe), pulp	Short ton	55.00 –70.00	53.00 –65.00	60.00 –65.00

The following are the designations on which quotations in the preceding table are based:

Crude barite, "f. o. b. mines."
Ground barite, "domestic, including barrels, f. o. b. St. Louis."
Lithopone, "in barrels, l. c. l."
Barium carbonate, "bags, works."
Barium chlorate, "kegs."
Barium chloride, "crystals, bags."
Barium nitrate, "casks."
Barium sulphate (blanc fixe), "dry, in barrels, l. c. l."
Barium sulphate (blanc fixe), "pulp, works."

PRODUCERS

Producers of barium products in the United States active in 1927 are listed below, with the addresses of their main offices and the locations of their plants.

Ground barite:	
Chemical & Pigment Co. (Inc.), Oakland, Calif	Oakland, Calif.
Clinchfield Sand & Feldspar Co., Baltimore, Md	Kings Creek, S. C.
C. P. De Lore Co., St. Louis, Mo	Mississippi River and River Des Peres, St. Louis, Mo.
Flynt Silica & Spar Co., Los Angeles, Calif	Daggett, Calif.
National Pigments & Chemical Co., St. Louis, Mo	St. Louis, Mo.
Thompson, Weinman & Co., New York, N. Y	Cartersville, Ga.
Lithopone:	
Chemical & Pigment Co. (Inc.), Oakland, Calif	Oakland, Calif.
Do	Collinsville, Ill.
Do	St. Helena, Md.
E. I. du Pont de Nemours & Co., Wilmington, Del	Newark, N. J.
Do	Philadelphia, Pa.
Eagle-Picher Lead Co., Chicago, Ill	Argo, Ill.
Grasselli Chemical Co., Cleveland, Ohio	Grasselli, N. J.
Krebs Pigment & Chemical Co., Newport, Del	Newport, Del.
Mineral Point Zinc Co., care New Jersey Zinc Co., New York, N. Y.	Depue, Ill.

Lithopone—Continued.	
New Jersey Zinc Co. (of Pennsylvania), New York, N. Y.	Palmerton, Pa. (2 plants).
Sherwin-Williams Co., Cleveland, Ohio	Chicago, Ill.
United Color & Pigment Co., Newark, N. J	Newark, N. J.
Barium chemicals:[3]	
Alton Barium Products Co., Alton, Ill	Alton, Ill.
Barium Products (Inc.), Modesto, Calif	Modesto, Calif.
Barium Reduction Corporation, Charleston, W. Va	South Charleston, W. Va.
Chicago Copper & Chemical Co., Chicago, Ill	Blue Island, Ill.
E. I. du Pont de Nemours & Co., Wilmington, Del	Philadelphia, Pa.
Grasselli Chemical Co., Cleveland, Ohio	Grasselli, N. J.
Oakland Chemical Co., New York, N. Y	New York, N. Y.
Titanium Pigment Co. (Inc.), New York, N. Y	Carondelet Station, St. Louis, Mo.

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[3] Includes only those using barite.

CLAY

By JEFFERSON MIDDLETON

GENERAL CONDITIONS

Clay available for the manufacture of clay products, the largest use, is widely distributed throughout the United States, and there are clay-working plants in every State. The tables of production that follow represent chiefly the clay that was mined and sold as clay, or mined under royalty or shipped into another State for fabrication, and do not include the clay that was burned into clay products by the producers themselves, unless it was mined under royalty or in a different State from that in which it was used. The quantity of clay thus sold is small compared with the total output and mainly includes clay used for making high-grade pottery and tile, paper, and refractory products. The values given for domestic production are f. o. b. mines or works; for imports, at the principal markets of the countries from which the clay was exported; for exports, at the port of shipment.

The domestic clay-mining industry in 1927 was in a fairly active condition. While both the total quantity and the total value of clay sold by producers decreased slightly—3 per cent—compared with 1926, the sales of kaolin, ball clay, and stoneware clay increased in both quantity and value. The total sales of clay in 1927 were exceeded in quantity by those of two years (1925 and 1926) only and were 24 per cent greater than those of 1917. In 1927, for two of the higher grades of clay—kaolin and ball clay—sales reached their maximum quantity and value. Fire clay was the only important kind to show a decrease; this decrease was probably due to the decreased demand for refractories in the iron and steel industries.

The increasing sales of domestic clays for use in the higher grades of ceramic products, for use in the paper industry, and for other uses which have been largely supplied by foreign material indicate the growing use of domestic clays in these industries in spite of adverse freight rates and lead to the hope that domestic manufacturers of these commodities may become independent of foreign supplies. In 1927 the domestic mines again supplied more than half of the new supply of kaolin in the United States.

Sales of domestic kaolin, the chief clay used in the manufacture of high-grade ceramic wares, paper, etc., increased 5 per cent in quantity over 1926, whereas the imports of kaolin or china clay decreased 14 per cent. The Southern States are the chief source of supply of kaolin, producing 81 per cent of the total in 1927; Georgia, the largest producer, reported 43 per cent of the total.

Ball clay, which is principally used with kaolin in the bodies of high-grade ceramic wares, increased 7 per cent in quantity and 5 per cent in value compared with 1926.

Slip clay, a low-temperature fusing material that formerly was used chiefly as a glaze on stoneware, now finds its main use as a binder in the manufacture of artificial abrasives. In 1927 sales of slip clay decreased about 29 per cent in quantity and value compared with 1926. The sources of supply of slip clay in 1927 were Michigan and New York.

Stoneware clay, the principal use of which is indicated by its name, increased 17 per cent in quantity and 10 per cent in value as compared with 1926. The term "stoneware clay" is used rather loosely, and much, if not all, of the fire and miscellaneous clays reported as having been sold for the manufacture of stoneware might properly be classed as stoneware clay.

Fire clay, which constituted 70 per cent of the total quantity of clay sold by producers in 1927, decreased 4 per cent in quantity and 5 per cent in value compared with 1926. The quantity sold in 1927 was greater than that sold in 1917 by 351,789 tons, or 15 per cent, and its value was greater by $2,094,630, or 37 per cent. The sales of fire clay in 1927 were the second largest recorded and were exceeded only by those of 1926. The chief use of this clay, as its name indicates, is in the refractory industries. Considerable quantities are also used in the manufacture of sanitary ware, stoneware, high-grade tile, architectural terra cotta, saggers, plaster, and other commodities.

Miscellaneous clays embrace those used in many industries; the larger part of the output is used in the manufacture of heavy-clay products, such as building and drainage materials. Clay included under this head is also used for cosmetics, filtering oil (after chemical treatment), flower pots, foundries, modeling, pencil leads, taxidermy, water softening, and other purposes.

NEW PROCESS FOR REFINING KAOLIN

The age-old method of refining kaolin by washers, sand wheels, troughs, concentrating tanks, etc., has been superseded in western North Carolina and other southern clay regions by a new process, using a bowl classifier, developed by Norman G. Smith & Co.(Inc.), Spruce Pine, N. C.

The following description of the new process is quoted from the Sunday Citizen, Asheville, N. C., issue of July 22, 1928:

> The new method of refining kaolin * * * is entirely a mechanical one. The clay is washed from the beds as before by the hose. No settlings, washers, or beaters are used. No men are required to shovel sand. A bowl classifier accomplishes all these operations in one.
>
> This bowl classifier consists of a settling box in the form of an inclosed trough, with the upper end open, in which are placed mechanically operated rakes or scrapers for the purpose of removing the quick-settling material from the open end.
>
> Each rake is carried by two hangers, one at the sand-discharge end suspended from an arm attachment to a rocker arm or lever, which terminates in a roller, the other from a bell-crank which is connected by a rod to the same rocker. The roller is pressed against a cam on the crank shaft. The rakes are lifted and lowered at opposite ends by the action of the cam transmitted through the rocker arms and bell cranks, and the horizontal motion is obtained directly from the crank.
>
> Upon the lower side of this acting box is superimposed a broad shallow steel bowl twenty-two feet in diameter, with stirring or thickening mechanism.
>
> The thickening is accomplished by the same principle as the settling of the sand in the troughs. Revolving arms, to which plow blades are attached, sweep the bottom, pushing the quick-settling solids toward a central opening through which they fall to the bottom of the main classifier tank and are subject to the action of the rakes. The feed enters the bowl through a shallow feed well near the center.

Wash water is introduced near the center of the main tank and flows center-current to the solids, up through the central opening of the bowl. The clay is overflowed into a peripheral launder around the rim of the bowl. The sand and other impurities are carried out by the rakes. It is obvious that the action of the plows and the rakes, together with the center flow of wash water, will produce a very complete washing and separation.

The bowl mechanism is operated by a light belt from an extension of the main drive shaft * * *. The power is negligible. The plow arms are usually revolved at from one-half to eight revolutions per minute, according to the load of solids handled and classification desired.

"It certainly has proved a great success and saves us the labor of three men every day, also from three to five tons of clay," the superintendent of the plant stated when asked if it was more successful than the old system.

The classifier used by this company is manufactured by the Dorr Bowl Classifier Company, which make classifiers for the chemical and metallurgical industries, which includes hundreds of the leading industrial companies of the world. A special machine was built for this trial with the clay.

Since its successful use by the North Carolina Company refineries in Georgia and Florida are using a similar machine with like results.

When the clay leaves the classifier it is run through the filter process, is dried and ready for shipment. The clay in going through the process is ready for shipment much earlier and is a more uniform and better product than by the old sand trough method.

PRODUCTION

Clay sold by producers in the United States, 1918–1927, by kinds

Year	Kaolin or china clay and paper clay		Ball clay		Slip clay		Fire clay	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1918	179,694	$1,459,529	89,896	$590,631	13,552	$49,898	2,305,033	$5,664.064
1919	152,828	1,475,681	65,026	520,849	5,149	17,556	1,755,331	4,628,605
1920	268,203	2,865,407	69,477	584,611	9,006	41,519	2,261,915	7,088.049
1921	162,726	1,579,163	54,014	354,565	4,608	14,841	1,195,861	3,560.373
1922	275,675	2,346,095	76,792	440.877	4,050	19,405	1,679,220	4.633,486
1923	336,803	2,926,255	97,068	620,978	8,520	43,609	2,298,163	6,565,899
1924	326,611	2,923,965	83.034	581,966	5,910	31,023	2,443,710	6,737,063
1925	367,319	3,220,719	109,607	699,427	7,349	37,397	2,566,934	7,312,349
1926	432,215	3,771,568	112,195	867,500	8,644	45,959	2.819,346	8,119.323
1927	454,245	3,809,834	119,763	913,976	6,137	32,264	2,699,761	7,719,725

Year	Stoneware clay		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	86,800	$147,098	301,386	$421,421	2,976,361	$8,332,641
1919	60,236	80,367	236,530	367,573	2,275,100	7,090,631
1920	106,350	229,221	322,100	467,856	3,037,051	11,276,663
1921	86,574	184,540	242.963	361,818	1,746,746	6,055,300
1922	86,866	164,870	525,097	725,781	2,647,700	8,330,514
1923	81,389	191,358	612,717	837,814	3,434,660	11,188.913
1924	59,194	117,142	772,660	1,116,377	3,691,119	11,507,536
1925	77,438	162.161	901,773	1,304,579	4,030,420	12,736,632
1926	84,002	185,288	510,796	1,115,951	3,967,198	14.105,589
1927	98,355	203,648	470,915	1,017,712	3,849,176	13,697,159

In 1927 operators in 43 States and the District of Columbia sold clay as such. The leading 10 States in order of quantity sold in 1927 were Pennsylvania (23.3 per cent of the total of the United States), Missouri (10.8 per cent), Ohio (8.4 per cent), New Jersey (8.1 per cent), California (7.5 per cent), Georgia (5.8 per cent), Colorado (5.7 per cent), Illinois (5.2 per cent), Indiana (4.2 per cent), and Tennessee (3.9 per cent). Pennsylvania, Missouri, California, and Tennessee maintained the ranks they held in 1926—namely, first, *Clay sold by producers in the United States in 1926, by States and kinds*

State	Number of operators reporting sales	Kaolin or china clay and paper clay		Ball clay		Fire clay		Stoneware clay		Miscellaneous clay[1]		Total	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	13					96,490	$150,101	35	$53	13,482	$21,270	110,007	$171,424
Arizona	(2)									(2)	(2)	(2)	(2)
Arkansas	(2)					442	2,106					442	2,106
California	38	(2)	(2)	(2)	(2)	161,898	424,920	4,312	7,212	125,748	345,343	297,329	804,978
Colorado	17					172,158	221,393	1,222	3,055	26,487	30,075	199,867	254,523
Connecticut	3					435	7,591			359	1,900	794	9,491
Delaware	3	5,115	$80,868			1,604	6,416			518	2,158	7,237	89,442
Florida	4	56,344	772,124									56,344	772,124
Georgia	16	175,230	1,357,923			(2)	(2)	(2)	(2)			205,801	1,398,061
Idaho	(2)					569	5,787					569	5,787
Illinois	19			(2)	(2)	171,036	343,564	26,698	42,347	(2)	(2)	205,926	410,476
Indiana	15	(2)	(2)			168,263	200,463	(2)	(2)	34,820	20,934	206,233	237,497
Iowa	3					(2)	(2)			(2)	(2)	1,717	13,707
Kentucky	17			52,784	$421,253	75,801	285,523					128,585	706,776
Maine	(2)					(2)	(2)			(2)	(2)	(2)	(2)
Maryland	13	7,000	10,500			22,263	83,295			32,063	37,123	61,326	130,918
Massachusetts	7					675	25,733			1,275	3,240	1,950	28,973
Michigan	5									4,287	9,349	4,287	9,349
Minnesota	3									11,850	26,719	11,850	26,719
Mississippi	3					3,433	32,308	(2)	(2)	(2)	(2)	4,873	34,958
Missouri	34			2,880	21,920	452,449	1,539,271	3,000	4,500	2,417	5,335	460,746	1,571,026
Montana	3					7,552	12,985			7,434	4,260	14,986	17,245
Nebraska	3					350	1,975			35,013	35,285	35,363	37,260
Nevada	5	764	7,019							11,254	71,808	12,018	78,827
New Jersey	44			5,919	39,862	292,155	1,296,759	16,506	74,617	28,006	52,050	342,586	1,463,288
New Mexico	5					2,118	10,517					2,118	10,517
New York	7					(2)	(2)			(2)	(2)	13,688	98,616
North Carolina	6	20,719	331,487					50	75			20,769	331,562
North Dakota	(2)					(2)	(2)					(2)	(2)
Ohio	60					302,868	779,842	28,628	43,697	7,118	26,721	338,614	850,260
Oregon	(2)					473	1,009					473	1,009
Pennsylvania	91	72,784	346,894			717,086	2,121,474	1,630	4,599	64,332	90,407	855,832	2,563,374
South Carolina	9	60,404	592,262			1,769	68,180					62,173	660,442
South Dakota	3									1,810	17,800	1,810	17,800
Tennessee	15			44,248	348,761	63,691	226,258			65,574	77,210	173,513	652,229
Texas	9					(2)	(2)			(2)	(2)	2,682	16,754
Utah	7					2,949	16,121			5,203	91,842	8,152	107,963
Vermont	(2)	2,027	11,364									2,027	11,364
Virginia	3	(2)	(2)			576	2,376			(2)	(2)	29,945	243,197

Washington	8					1,500	15,381	756	2,268	10,691	13,866	12,947	31,515
West Virginia	6					63,446	113,007					63,446	113,007
Wisconsin	(2)									220	220	220	220
Wyoming	3									4,409	96,853	4,409	96,853
Undistributed	14	31,828	261,127	6,364	35,704	35,297	124,968	1,165	2,865	25,070	80,142	3,544	23,952
	514	432,215	3,771,568	112,195	867,500	[3]2,819,346	[3]8,119,323	84,002	185,288	[4]519,440	[4]1,161,910	3,967,198	14,105,589
Average value per ton			8.73		7.73		2.88		2.21				3.56

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[1] Includes adobe, ardmorite, bentonite, montmorillonite, shale, etc. Slip clay is also included in this column as a matter of statistical convenience.

[2] Included under "Undistributed."

[3] These totals include 18,483 tons of diaspore clay from Missouri, valued at $100,823.

[4] These totals include 8,644 tons of slip clay, valued at $45,959, or $5.32 per ton, from Michigan (556 tons, valued at $3,422) and New York (8,088 tons, valued at $42,537).

Clay sold by producers in the United States in 1927, by States and kinds

State	Number of operators reporting sales	Kaolin or china clay and paper clay		Ball clay		Fire clay		Stoneware clay		Miscellaneous clay[1]		Total	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	13					120,831	$169,345			6,566	$7,073	127,397	$176,418
Arizona	1									(2)	(2)	(2)	(2)
Arkansas	2					335	1,966					335	1,966
California	34	939	$9,416	5,012	$22,131	194,479	456,489	4,107	$11,510	85,772	278,874	290,309	778,420
Colorado	19	50	131			186,068	284,389	930	2,325	31,207	33,149	218,255	319,994
Connecticut	3					(2)	(2)			(2)	(2)	621	6,225
Delaware	3	4,893	77,004			1,062	3,186			606	2,466	6,561	82,656
District of Columbia	1									(2)	(2)	(2)	(2)
Florida	4	47,319	646,415									47,319	646,415
Georgia	17	193,151	1,492,857			(2)	(2)			(2)	(2)	222,938	1,537,378
Idaho	2					477	5,748					477	5,748
Illinois	21			854	15,109	170,571	319,913	20,187	29,390	6,694	16,816	198,306	381,228
Indiana	12	1,500	7,500			122,354	155,123			39,739	43,738	163,593	206,361
Iowa	4					2,458	16,416			5	100	2,463	16,516
Kentucky	18			50,694	421,930	(2)	(2)			(2)	(2)	119,829	662,149
Maine	3					(2)	(2)			(2)	(2)	266	3. 392
Maryland	13	(2)	(2)	(2)	(2)	12,145	51,266			10,197	14,220	38,551	102,690
Massachusetts	9					849	10,277			777	12,963	1,626	23,240
Michigan	4									3,539	6,620	3,539	6,620
Minnesota	5							16,806	38,028	481	2,612	17,287	40,640
Mississippi	3					1,805	18,488	(2)	(2)	(2)	(2)	2,805	20,308
Missouri	36	(2)	(2)	(2)	(2)	409,520	1,669,551	4,528	7,924	917	1,817	416. 490	1,693,792
Montana	4					5,635	20,142			7,572	4,089	13,207	24,231
Nebraska	5					200	625			3,931	4,134	4,131	4,759
Nevada	4	1,066	8,991							4,844	27,467	5,910	36,458
New Jersey	43			5,901	33,083	251,205	1,134,143	12,406	55,298	42,898	48,048	312. 410	1,270,572
New Mexico	6					8,196	17. 414					8,196	17,414
New York	7					1,733	20,741			5,678	30,371	7,411	51,112
North Carolina	5	20,334	327,638					50	50			20,384	327,688
North Dakota	1	4	52			14	263					18	315
Ohio	62					283,936	730,082	35,022	50,271	6,177	19,579	325,135	799. 932
Oregon	3					310	574	(2)	(2)	(2)	(2)	2,570	2,834
Pennsylvania	94	75,939	342,607			700,869	1,895,668	1,323	3,744	119,667	161,409	897,798	2,403. 428
South Carolina	10	78,401	666,269			(2)	(2)			(2)	(2)	81,010	743,742
South Dakota	2									1,056	4,194	1,056	4. 194
Tennessee	12			45,593	380,019	61,243	230,668			42,793	51,126	149,629	661,813
Texas	10					2,449	15,055			744	4,008	3,193	19. 063
Utah	7					9,714	25,785			7,599	82,595	17,313	108,380
Vermont	1	(2)	(2)									(2)	(2)

Virginia	3	(1)	(2)			663	2,570			(2)	(2)	25,497	211,869
Washington	9					720	8,423	726	2,178	30,017	29,827	31,463	40,428
West Virginia	5					48,332	85,304					48,332	85,304
Wisconsin	2									(2)	(2)	(2)	(2)
Wyoming	4					2	17			7,498	121,146	7,500	121,163
Undistributed		30,649	230,954	11,709	41,704	101,586	370,094	2,270	2,930	10,078	41,535	8,046	50,304
	526	454,245	3,809,834	119,763	913,976	[3] 2,699,761	[3] 7,719,725	98,355	203,648	[4] 477,052	[4] 1,049,976	3,849,176	13,697,159
Average value per ton			8.39		7.63		2.86		2.07				3.56

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[1] Includes ardmorite, bentonite, montmorillonite, shale, etc. Slip clay is also included in this column as a matter of statistical convenience.

[2] Included under "Undistributed."

[3] These totals include 40,085 tons of diaspore and burley clay from Missouri, valued at $229,093.

[4] These totals include 6,137 tons of slip clay, valued at $32,264, or $5.26 a ton, from Michigan (460 tons, valued at $1,908) and New York (5,677 tons, valued at $30,356).

second, fifth, and tenth. New Jersey fell from third in 1926 to fourth in 1927, exchanging places with Ohio; Indiana fell from sixth to ninth, and Illinois from seventh to eighth. Georgia rose from eighth in 1926 to sixth in 1927 and Colorado rose from ninth to seventh. These 10 States reported 83 per cent of the total in 1927, and the first 5 of them reported 58 per cent. In each of these States, except Georgia and Tennessee, the sales of fire clay in 1927 constituted more than half the total sales and ranged from 67 per cent of the State total in California to 98 per cent in Missouri. Of the 43 States in which clay was sold in 1927, 15 reported increase in quantity and 18 reported increase in total value compared with 1926.

PRODUCTION BY USES

Statistics showing the production of clay by uses are necessarily incomplete, as many clay miners do not know the purpose to which their clay is put, but it is believed that the figures given in the following table are sufficiently complete to serve as a guide in the study of the uses of domestic clays. In considering these figures it should be borne in mind that they represent chiefly the clay sold as clay by the original producers and do not include the much greater quantities of clay that are burned into clay products by those who mine their own clay.

Clay sold by producers in the United States, 1926 and 1927, by uses, in short tons

Use	1926						
	Kaolin	Ball clay	Slip clay	Fire clay	Stoneware clay	Miscellaneous clay	Total
White-bodied ware made from white-burning clays	69,655	55,509		15,261			140,425
Art pottery	1,028	5,210		2,588		183	9,009
High-grade tile	23,862	33,297		7,822	1,200	2,868	69,049
Chemical stoneware	1,567	90		1,269	6,474		9,400
Stoneware	479	84		11,828	54,585		66,976
Enameling	4	734					738
Paper filler	156,897	60		500		1,102	158,559
Paper coating	3,543			800			4,343
Rubber	25,190						25,190
Oilcloth or linoleum	9,256						9,256
Paint filler or extender	13,762					70	13,832
Paint pigment	16						16
Architectural terra cotta	200	93		69,157	20,220	5,875	95,545
Asbestos products	1,353	616		2,297		1,619	5,885
Plaster and plaster products	7,721			11,613		4,726	24,060
Slip for glazing purposes			2,781				2,781
Cement	57,116			5,327			62,443
Kalsomine	2,545			847			3,392
Artificial abrasives	7	81	5,863	5,055	1,149		12,155
Crayons	408						408
Chemicals	3,033						3,033
Saggers	6,994	14,794		174,395	224		196,407
Pins, stilts, and spurs for potters' use	400	151		8,080			8,631
Wads				35,160			35,160
Gas retorts				4,097			4,097
Fire brick and block	32,168			782,760		10,067	824,995
Fire-clay mortar	2,457	640		542,580		2,229	547,906
Bauxite and high alumina brick				2,500			2,500
Glasshouse pots	150	118		24,889			25,157
Glasshouse supplies, blocks, tiles, etc				1,799			1,799
Zinc retorts and condensers				56,335			56,335
Clay crucibles	100			2,039			2,139
Graphite crucibles and stoppers		269		1,292			1,561
Foundries, steelworks, etc	73			479,360		44,227	523,660
Unspecified [1]	12,231	449		569,696	150	437,830	1,020,356
	432,215	112,195	8,644	2,819,346	84,002	510,796	3,967,198

Footnote at end of table.

Clay sold by producers in the United States, 1926 and 1927, by uses, in short tons—Continued

Use	1927						
	Kaolin	Ball clay	Slip clay	Fire clay	Stoneware clay	Miscellaneous clay	Total
White-bodied ware made from white-burning clays	64,578	60,366	--------	16,764	1,764	--------	143,472
Art pottery	500	423	--------	900	509	272	2,604
High-grade tile	22,790	29,905	--------	18,639	568	3,814	75,716
Chemical stoneware	76	--------	--------	963	7,261	211	8,511
Stoneware	--------	1,078	--------	2,642	74,594	--------	78,314
Enameling	26	708	--------	--------	--------	--------	734
Paper filler	192,307	--------	--------	--------	--------	1,201	193,508
Paper coating	3,510	--------	--------	--------	--------	--------	3,510
Rubber	27,428	--------	--------	2,305	--------	842	30,575
Oilcloth or linoleum	14,511	--------	--------	--------	--------	--------	14,511
Paint filler or extender	12,084	--------	--------	--------	--------	1,250	13,334
Paint pigment	14	331	--------	--------	--------	--------	345
Architectural terra cotta	100	9,538	--------	76,538	12,960	6,480	105,616
Asbestos products	440	579	--------	--------	--------	1,364	2,383
Plaster and plaster products	6,224	--------	--------	11,491	--------	4,075	21,790
Slip for glazing purposes	--------	--------	2,478	--------	--------	--------	2,478
Cement	58,594	--------	--------	1,224	--------	--------	59,818
Kalsomine	3,959	--------	--------	--------	--------	--------	3,959
Artificial abrasives	--------	776	3,659	3,272	498	51	8,256
Crayons	500	--------	--------	--------	--------	--------	500
Chemicals	1,500	--------	--------	--------	--------	--------	1,500
Pencil leads	--------	--------	--------	--------	--------	206	206
Saggers	5,304	15,238	--------	144,210	--------	300	165,052
Pins, stilts, and spurs for potters' use	300	--------	--------	6,346	--------	--------	6,646
Wads	--------	--------	--------	33,463	--------	--------	33,463
Gas retorts	--------	--------	--------	376	--------	--------	376
Fire brick and block	26,629	--------	--------	921,440	--------	8,295	956,364
Fire-clay mortar	1,871	426	--------	461,078	--------	--------	463,375
Bauxite and high alumina brick	--------	--------	--------	10,409	--------	30	10,439
Glasshouse pots	--------	--------	--------	25,184	--------	--------	25,184
Glasshouse supplies, blocks, tiles, etc	295	242	--------	1,365	--------	--------	1,902
Zinc retorts and condensers	--------	--------	--------	79,299	--------	--------	79,299
Clay crucibles	--------	--------	--------	3,140	--------	--------	3,140
Graphite crucibles and stoppers	--------	108	--------	--------	--------	--------	108
Foundries, steel works, etc	87	--------	--------	442,292	65	39,660	482,104
Unspecified[1]	10,618	45	--------	436,421	136	402,864	850,084
	454,245	119,763	6,137	2,699,761	98,355	470,915	3,849,176

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[1] 1926: Includes clay for blast furnaces, brick (building and paving), chimney blocks, copper converters, cosmetics, filtering or decolorizing oil, flower pots, flue lining, fuses, hollow building tile, modeling, retorts, sewer pipe, shoe and stove polish, soap products, taxidermy, toy marbles, wall paper, water softener, etc.; also black-burning clay. 1927: Includes clay for blast furnaces, building brick, conduits, copper ladles, cosmetics, enameled brick, dobies, filtering or decolorizing oil, flowerpots, flue lining, hollow building tile, modeling, mortar colors, roofing tile, sewer pipe, smelters, soap, taxidermy, toy marbles, turpentine cups, water softener, etc.; also black-burning clay.

ENGLISH CHINA-CLAY INDUSTRY IN 1927

The following paragraphs quoted from a paper on the English china-clay industry in 1927, based on reports from Trade Commissioner Homer S. Fox, London, and from the consulate at Plymouth, England, and published by the United States Department of Commerce in Commerce Reports, No. 11, March 12, 1928, may be of interest:

The production of china clay in England for 1927 reached a record output of 997,269 long tons, just short of the million mark. The highest previous record was attained in 1912, when there was an output of 963,895 tons, including 73,284 of china stone. The 1927 total, comprised of 920,074 tons of china clay, 54,551 of china stone, and 22,644 of ball clay, compared with an output of 934,360 tons in 1926. All three items showed increases, although in the case of ball clay the difference was unimportant.

The English china-clay beds are located over a wide area in Cornwall and Devon. The deposits vary greatly as to size as well as to the quality of clay. In all cases they are covered by an overburden of soil, sometimes a peat bed and detritus brought down from the adjacent slopes. The overburden is from 10 to 50 feet or more in depth. It is reliably stated that there has been no material change in the method of winning china clay in this district during the past 10 years or more, and that practically every pit produces from 3 to 10 or more commercial grades, depending upon the color of the refined clay and its fineness. It seems that there is at present no standard of grading clays adopted by the china-clay concerns. The new association of china-clay firms, scheduled to begin functioning early in 1928, has announced "the sampling of clays and placing them in their appropriate grades" as an important branch of its proposed work.

The commercial term, "china clay" covers all varieties, whether for paper making, pottery, or other purposes, although ball clay is used mostly for pottery and crucible clay in the limited cases where high heat-resisting quality is demanded. China clays shipped from this district to the United States are not given any particular grade, but rather trade-brand symbols, a single invoice of a shipment embracing possibly half a dozen or more qualities.

Preliminary figures for 1927 indicate an exportation of 661,826 long tons of china clay during that year as compared with 651,990 in 1926 and 652,576 in 1925. A satisfactory feature of the export trade in 1927 was the gradual improvement in the oversea markets. Belgium took the largest share of English shipments of china clay to continental Europe. Germany, while still a long way behind its pre-war receipts of 90,000 tons per annum, is gradually creeping up in the export list and in 1927 reached its highest total since the war. Exports to the United States decreased markedly during December, 1927, amounting to only 16,251 tons as compared with 26,837 during December, 1926—a decline of almost 40 per cent. Figures for the whole of 1926 and 1927 reveal that the annual exportation to America also showed a decided drop, amounting to about 27 per cent.

* * * * * * *

Since 1924 the china clay industry in England has been without any organized cooperation. In that year internal dissension caused the collapse of the Associated China Clays (Ltd.), which apparently was a loosely knit association without interlocking capital, intended for the better coordination of the china-clay firms and the adjustment of export prices and terms. In the latter part of 1926 it was thought that complete agreement of all firms had been obtained for the formation of a new association of this type, but the plan failed owing to the objection of one firm. The need of some such organization seems to have been continuously felt by the industry, and since the second failure the organizers have been working out a scheme which all the china-clay export firms might be able to support.

During 1927 public announcement was made of the formation of an Associated China Clays (Ltd.) to begin to function during 1928. This organization apparently has the same objects as its predecessors—the cooperation of the member firms, the adjustment of prices, the elimination of underbidding among producers, perhaps the pro rata allotment of foreign orders to member firms, and, in general, consultation and concerted action looking to greater efficiency of the industry and the expansion of its trade at home and abroad.

The announcement states that the new organization is not at all aimed against purchasers through the fixing of prices, and points out that the competition from foreign clays and from substitutes for china clays would prevent the unreasonable increase of prices even if there existed any inclination to profiteer among the English producers. It adds: "An association such as that now being set up is not in any sense a combine, inasmuch as each producing firm will continue to operate individually, retaining its own management, control, and selling organization."

Another important development of the English china clay industry in 1927 was the investment by an American concern of considerable capital (amount not disclosed) in Cornish china clay properties. This concern for years has been a heavy importer of china clay from this district and has had a local office and a purchasing agent—an arrangement maintained by other American firms. This is the first step, however, taken by American paper makers to provide their own production of English china clay, and marks an important development in the handling of the china clay output of Cornwall. China clay has been exported for many years from this district to the United States.

The two English firms taken over by the American purchasers are the Anchor United China Clay Co. (Ltd.) and the Melangoose China Clay Co., the works of both firms being located at St. Stephens, near St. Austell. The combined output of the china-clay mines operated by these firms is reported at 50,000 tons per year, with a possibility of considerable expansion should the demand render further development desirable. The product of these mines has been on the market for more than 30 years. Although the present equipment is extensive, it is understood that it will be somewhat enlarged, for the purpose of speeding up production, and also to effect further economy and facilitate refining of the product.

Over 80 per cent of the china clay shipped from this district by water (practically all that going to the United States) passes through the small port of Fowey, Cornwall, which has a present estimated capacity for loading ships of about 20,000 tons per week. The low freight rates to the United States are accounted for by the fact that most of the vessels employed are tramp steamers which have discharged a cargo at a neighboring port and are returning to America. Fowey is one of the few ports in this region where a homogeneous cargo can be obtained for a United States port, and steamship owners apparently are glad to obtain a clay cargo even at nominal freight rates rather than cross the Atlantic in ballast.

IMPORTS AND EXPORTS[1]

Clay imported for consumption in the United States, 1918–1927

Year	Kaolin or china clay			Common blue and Gross Almerode glass-pot clay		All other clays				Total	
						Unwrought		Wrought			
	Short tons	Value		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
		Total	Average								
1918	168,100	$1,153,240	$6.86	114	$983	26,984	$163,484	137	$1,087	195,335	$1,318,794
1919	180,592	1,965,393	10.88	4	133	23,759	187,550	498	4,262	204,853	2,157.338
1920	361,800	3,568,677	9.86	6,837	157,201	34,252	272,524	691	10,267	403,580	4,008,669
1921	162,906	1,546,285	9.49	4,468	77,217	41,421	348,870	120	2,313	208,915	1,974,685
1922	310,136	2,963,420	9.56	7,323	84,415	40,624	327,388	2,566	29,398	360,649	3,404,621
1923	311,298	3,046,191	9.79	12,999	121,272	65,379	481,614	1,676	21,892	391,352	3,670,969
1924	353,124	3,188,454	9.03	7,059	62,883	82,562	706,018	1,322	18,685	444,067	3,976,040
1925	372,552	3,195,694	8.58	11,889	107,940	49,991	499,325	2,383	29,266	436.815	3,832,225
1926	396,219	3,484,054	8.79	6,608	60,391	84,512	672,223	2,331	31,243	489,670	4,247,911
1927	339,014	2,937,113	8.66	3,884	39,451	50,017	447,888	1,585	24,518	394,500	3,448,970

Domestic clay exported from the United States, 1918–1927

Year	Fire clay		All other		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	60,206	$333,880	24,348	$192,053	84,554	$525,933
1919	37,486	262,501	30,983	249,571	68,469	512,072
1920	54,125	393,177	66,035	775,222	120,160	1,168,399
1921	23,666	177,979	23,779	183,449	47,445	361,428
1922	24,391	169,664	[a]23,285	[a]267,908	47,676	437,572
1923	50,055	303.675	34,840	329,192	84,895	632,867
1924	41,704	312,676	31,051	420,040	72,755	732,716
1925	44,037	350,571	39,006	530,995	83,043	881,566
1926	47,737	348,302	42,157	644,416	89,894	992,718
1927	48,106	392,327	51,278	725,562	99,384	1,117,889

[a] Includes 2,091 short tons of "kaolin, china, and paper clay," valued at $27,840. Similar exports are not separately classified for other years.

[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Imports of clay decreased 19 per cent in both quantity and value compared with 1926. Imports of kaolin or china clay, which constituted 86 per cent of the total quantity imported in 1927 and came chiefly from England, decreased 57,205 tons, or 14 per cent, compared with 1926 and the value decreased $546,941, or 16 per cent. The average value per ton of imported kaolin decreased 13 cents, and except for 1925 was the lowest since 1918. The imports of high-grade refractory clay, entered under the classification "Common blue and Gross Almerode glass-pot clay," decreased 41 per cent in quantity and 35 per cent in value compared with 1926 and were the smallest since 1919. Imports under unwrought clays, which are thought to include ball clay, decreased 41 per cent in quantity and 33 per cent in value compared with 1926.

In 1927 exports of domestic clay increased 11 per cent in quantity and 13 per cent in value compared with 1926. Fire clay, which constituted 48 per cent of the total quantity of clay exported and 35 per cent of its value, increased less than 1 per cent in quantity but 13 per cent in value compared with 1926. The exports of clay in 1927 were the largest recorded except those in 1920, the year of greatest quantity and value, from which they decreased 17 per cent in quantity and 4 per cent in value.

CEMENT

By B. W. Bagley

GENERAL REVIEW

The Portland cement produced in 1927—173,206,513 barrels—was the largest quantity manufactured in any year, exceeding by 5 per cent that in 1926, the year next highest in production.

There were shipped from the mills in 1927, 171,864,728 barrels of Portland cement, valued at $278,854,647, an increase of 6 per cent in quantity and of 0.3 per cent in gross value. The average factory value per barrel, in bulk, was $1.62, a decrease of 9 cents per barrel s compared with 1926.

The stocks of finished Portland cement at the mills also increased, reaching a total of 22,081,972 barrels on December 31, 1927, the greatest at the end of any year during which official records of stocks have been kept. They were 6 per cent higher than at the end of 1926. According to estimates by the manufacturers, there were also on hand at the mills at the end of December, 1927, 7,660,000 barrels of clinker, or unground cement, as compared with 7,799,000 barrels at the end of 1926.

Early in January, 1928, the Bureau of Mines published a summary of the monthly estimates of output of Portland cement in 1927, compiled from the monthly reports of producers. The production and shipments shown by these preliminary figures were within about 0.7 and 0.5 per cent, respectively, of the final figures of production and shipments for 1927.

With the exception of February, when there was a slight decrease from 1926, monthly production in 1927 was at a higher rate than in 1926. Shipments also showed increases over 1926 in each month except May and December.

Production and shipments of Portland cement both reached their maximum in August, 1927, and were higher than for any other month in the history of the industry; the production in August—18,315,000 barrels—was 6 per cent greater than that of the entire country for 1902. The production of masonry, natural, and puzzolan cements also increased in 1927, exceeding that in 1926 by 1 per cent.

The general trend of building construction during the years 1924 to 1927 is shown by the following table, which summarizes the value of buildings as shown by permits issued during those years in 210 cities, representing all parts of the United States. The grand total increased in 1925 over 1924 but decreased in both 1926 and 1927. In the decrease of 11 per cent in 1927 from 1926 all the districts except Colorado-Utah-Montana-Idaho-Wyoming participated.

Value of buildings shown by permits issued in 210 cities in the United States, 1924–1927 [1]

Group of cities	1924	1925	1926	1927	Increase or decrease, 1927 from 1926 (per cent)
New England	$209, 983, 000	$251, 184, 000	$198, 844, 000	$190, 541, 000	−4
New York and northern New Jersey	1, 071, 288, 000	1, 278, 820, 000	1, 317, 632, 000	1, 168, 161, 000	−11
Eastern Pennsylvania, southern New Jersey, Maryland, Delaware, District of Columbia, and Virginia	334, 366, 000	386, 637, 000	316, 990, 000	259, 844, 000	−18
Western Pennsylvania, West Virginia, Ohio, and Kentucky	265, 343, 000	309, 712, 000	273, 862, 000	253, 640, 000	−7
Illinois, Indiana, Iowa, Wisconsin, Michigan, Missouri, Kansas, Nebraska, and Oklahoma	769, 645, 000	906, 186, 000	894, 393, 000	826, 340, 000	−8
Minnesota, North Dakota, and South Dakota	56, 222, 000	65, 548, 000	48, 762, 000	40, 726, 000	−16
North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, Arkansas, and Louisiana	176, 363, 000	234, 617, 000	228, 085, 000	156, 265, 000	−31
Arizona, New Mexico, and Texas	76, 869, 000	98, 083, 000	94, 769, 000	85, 278, 000	−10
Colorado, Utah, Montana, Idaho, and Wyoming	36, 669, 000	39, 623, 000	25, 682, 000	28, 629, 000	+11
California, Washington, and Oregon	394, 940, 000	417, 065, 000	359, 802, 000	329, 098, 000	−9
	3, 391, 688, 000	3, 987, 475, 000	3, 758, 821, 000	3, 338, 522, 000	−11

[1] From Bulletin of Portland Cement Association, showing values tabulated in detail by cities, based on Bradstreet's and F. W. Dodge Corporation building statistics.

The following table summarizes the value of contracts awarded in eastern and central States for buildings of all classes and for engineering construction of all other kinds, including public works. The grand total increased successively from 1924 to 1926 but decreased 1 per cent in 1927 from 1926.

Value of contracts awarded for building and all other construction work in eastern and central States, 1924–1927 [1]

Group of States	1924	1925	1926	1927	Increase or decrease, 1927 from 1926 (per cent)
New England	$352, 195, 000	$477, 181, 000	$441, 183, 000	$412, 767, 000	−6
New York and northern New Jersey	1, 326, 896, 000	1, 601, 257, 000	1, 775, 060, 000	1, 684, 445, 000	−5
Eastern Pennsylvania, southern New Jersey, Maryland, Delaware, District of Columbia, and Virginia	477, 746, 000	552, 318, 000	689, 414, 000	721, 148, 000	+5
Western Pennsylvania, West Virginia, Ohio, and Kentucky	578, 365. 000	828. 642, 000	741, 368, 000	758, 135, 000	+2
Illinois, Indiana, Iowa, Wisconsin, Michigan, Missouri, Kansas, Nebraska, and Oklahoma	1, 049, 586, 000	1, 487, 310, 000	1, 669, 043, 000	1, 812, 849, 000	+9
Minnesota, North and South Dakota, and northern Michigan	88, 264, 000	95, 229, 000	102, 118, 000	83, 817, 000	−18
North and South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, Arkansas, and Louisiana	606, 255, 000	779, 132, 000	730, 317, 000	610, 789, 000	−16
Texas	(2)	185, 358, 000	232, 412, 000	219, 105, 000	−6
	4, 479, 307, 000	6, 006, 427, 000	6, 380, 915, 000	6, 303, 055, 000	−1

[1] From Bulletin of Portland Cement Association, based on compilations by F. W. Dodge Corporation.

[2] No data available prior to May, 1924.

CHIEF HYDRAULIC CEMENTS

The accompanying table gives statistics of output of Portland and other (masonry, natural, and puzzolan) hydraulic cements from 1918 to 1927. The quantity of these cements produced in the United States in 1927 increased 5 per cent as compared with 1926, while the shipments from the mills in 1927 increased 6 per cent in quantity and 0.3 per cent in value.

Statistics of output of alumina cement, representing the operations of only one manufacturer in the United States, are not included in this or other tables of this report. No production of this type of cement was reported for 1923, but it was marketed from 1924 to 1927. The indications are that it will steadily increase in use.

Principal hydraulic cements produced and shipped in the United States, 1918–1927

Year	Production					
	Portland cement		Masonry, natural, and puzzolan cements		Total	
	Number of active plants	Barrels	Number of active plants	Barrels	Number of active plants	Barrels
1918	114	71,081,663	9	(1)	123	(1)
1919	111	80,777,935	8	(1)	119	(1)
1920	117	100,023,245	9	(1)	126	(1)
1921	115	98,842,049	9	(1)	124	(1)
1922	118	114,789,984	9	(1)	127	(1)
1923	126	137,460,238	10	(1)	136	(1)
1924	132	149,358,109	10	(1)	142	(1)
1925	138	161,658,901	10	1,729,343	148	163,388,244
1926	140	164,530,170	11	2,104,891	151	166,635,061
1927	153	173,206,513	11	2,123,868	164	175,330,381

Year	Shipments					
	Portland cement		Masonry, natural, and puzzolan cements		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1918	70,915,508	$113,316,275	432,966	$401,341	71,348,474	$113,717,616
1919	85,612,899	146,734,844	528,589	583,554	86,141,488	147,318,398
1920	96,311,719	194,439,025	767,481	1,150,890	97,079,200	195,589,915
1921	95,507,147	180,778,415	539,402	897,025	96,046,549	181,675,440
1922	117,701,216	207,170,430	889,428	1,293,598	118,590,644	208,464,028
1923	135,912,118	257,684,424	1,271,674	1,947,352	137,183,792	259,631,776
1924	146,047,549	264,046,708	1,418,461	2,006,559	147,466,010	266,053,267
1925	157,295,212	278,524,108	1,751,725	2,551,583	159,046,937	281,075,691
1926	162,187,090	277,965,473	2,031,851	2,820,110	164,218,941	280,785,583
1927	171,864,728	278,854,647	2,158,323	2,881,029	174,023,051	281,735,676

[1] Figures for production of masonry, natural, and puzzolan cements not available.

PORTLAND CEMENT

PRODUCTION, SHIPMENTS, AND STOCKS

In 1927 Florida and Louisiana, with one new plant each, were included for the first time in the list of producing States. Of the 29 other States in which Portland cement was manufactured in 1927 all but 10 showed increases in both production and shipments as compared with 1926. All the commercial districts except western Missouri-Nebraska-Kansas-Oklahoma and Colorado-Montana-Utah showed increased production, and all but the last named showed increased shipments; the gains in both production and shipments ranged from 1 to 23 per cent. The net change for the whole country was an increase of 5 per cent in production and of 6 per cent in shipments. The production of 173,206,513 barrels of 376 pounds net is equivalent to 692,826,052 sacks, 29,073,950 long tons, or 32,562,824 short tons. In 1927 production exceeded shipments by 1,341,785 barrels.

In the accompanying table the statistics are arranged by States, so far as possible. The term "active plant" is applied to a mill or group of mills situated at one place and operated by one company. If a company has establishments at different places, its mill or group of mills at each place is counted as a plant. In the table by districts the statistics are for groups of States geographically and commercially related.

Portland cement produced, shipped, and in stock in the United States, 1926–27, by States and districts

	Production					Shipments							Stock (Dec. 31)		
	Active plants		Barrels		Increase or decrease, 1927 (per cent)	1926		1927		Average factory value per barrel		Increase or decrease in quantity, 1927 (per cent)	Barrels		Increase or decrease, 1927 (per cent)
	1926	1927	1926	1927		Barrels	Value	Barrels	Value	1926	1927		1926 (revised)	1927	
STATE															
Alabama	5	6	6,709,829	7,564,863	+13	6,693,900	$10,825,421	7,313,494	$10,615,428	$1.62	$1.45	+9	403,426	654,795	+62
California	11	12	13,842,483	14,580,654	+5	13,660,078	25,299,245	14,433,153	26,623,396	1.85	1.84	+6	662,006	809,507	+22
Illinois	4	4	6,747,241	7,017,047	+4	6,977,598	11,388,800	7,061,240	11,312,783	1.63	1.60	+1	812,468	768,275	−5
Iowa	4	5	4,925,811	5,415,144	+10	4,788,639	8,167,341	5,661,234	9,124,405	1.71	1.61	+18	1,616,842	1,370,752	−15
Kansas	7	7	6,357,581	6,180,255	−3	6,150,694	9,757,699	6,141,937	9,939,412	1.59	1.62	−.1	1,099,505	1,137,823	+3
Michigan	16	15	12,037,400	13,965,241	+16	11,959,447	19,499,788	13,708,259	20,858,202	1.63	1.52	+15	1,948,302	2,205,284	+13
Missouri	5	5	7,653,111	6,778,384	−11	7,639,966	12,917,342	6,929,229	11,117,047	1.69	1.60	−9	1,097,897	947,052	−14
New York	9	11	8,795,768	10,775,375	+23	8,535,862	14,864,066	10,531,092	16,380,090	1.74	1.56	+23	1,284,527	1,528,810	+19
Ohio	10	10	7,556,493	8,853,869	+17	7,422,720	12,831,503	8,727,879	14,242,901	1.73	1.63	+18	1,079,385	1,205,375	+12
Pennsylvania	23	25	42,865,694	43,732,278	+2	41,395,604	70,437,218	42,909,513	66,711,069	1.70	1.55	+4	4,714,827	5,537,592	+17
Tennessee	4	5	5,222,114	4,430,439	−15	5,053,528	8,352,095	4.343,337	6,580,732	1.65	1.52	−14	429,828	516,930	+20
Texas	6	7	5,007,374	5,655,835	+13	5,042,359	9,522,701	5,692,350	10,232,908	1.89	1.80	+13	443,918	407,403	−8
Other States [1]	36	41	36,809,271	38,257,129	+4	36,866,695	64,102,254	38,412,011	65,116,274	1.74	1.70	+4	5,147,256	4.992,374	−3
	140	153	164,530,170	173,206,513	+5	162,187,090	277,965,473	171,864,728	278,854,647	1.71	1.62	+6	20,740,187	22,081,972	+6
DISTRICT															
Eastern Pennsylvania, New Jersey, and Maryland	23	24	42,139,204	42,687,200	+1	40,635,514	69,581,973	41,656,489	64,614,336	1.71	1.55	+3	4,076,535	5,107,246	+25
New York	9	11	8,795,768	10,775,375	+23	8,535,862	14,864,066	10,531,092	16,380,090	1.74	1.56	+23	1,284,527	1,528,810	+19
Ohio, western Pennsylvania, and West Virginia	15	18	15,913,500	17,339,199	+9	15,758,822	26,336,705	17,202,341	27,638,726	1.67	1.61	+9	2,469,740	2,606,598	+6
Michigan	16	15	12,037,400	13,965,241	+16	11,959,447	19,499,788	13,708,259	20,858,202	1.63	1.52	+15	1,948,302	2,205,284	+13
Wisconsin, Illinois, Indiana, and Kentucky	11	11	21,350,107	22,022,150	+3	21,876,629	36,267,413	22,394,739	36,274,654	1.66	1.62	+2	2,986,830	2,614,241	−12
Virginia, Tennessee, Alabama, Georgia, Florida,[2] and Louisiana [3]	14	18	15,307,606	16,016,154	+5	14,963,262	24,860,207	15,530,338	23,668,315	1.66	1.52	+4	1,196,280	1,682,096	+41
Eastern Missouri, Iowa, Minnesota, and South Dakota	10	11	14,138,619	14,358,201	+2	14,026,247	23,754,460	14,566,818	23,325,158	1.69	1.60	+4	2,940,185	2,731,568	−7
Western Missouri, Nebraska, Kansas, and Oklahoma	11	11	10,277,391	10,092,888	−2	10,158,484	16,068,802	10,250,532	16,809,793	1.58	1.64	+1	1,777,409	1,619,765	−9
Texas	6	7	5.007,374	5,655,835	+13	5,042,359	9,522,701	5,692.350	10,232,908	1.89	1.80	+13	443,918	407,403	−8
Colorado, Montana, and Utah	7	8	2,523,509	2,179,241	−14	2,457,303	5,167,446	2,293,514	4,692,136	2.10	2.05	−7	483,820	369,547	−24
California	11	12	13,842,483	14,580,654	+5	13,660,078	25,299,245	14,433,153	26,623,396	1.85	1.84	+6	662,006	809,507	+22
Oregon and Washington	7	7	3,197,209	3,534,375	+11	3,113,083	6,742,667	3,605,103	7,736,933	2.17	2.15	+16	470,635	399,907	−15
	140	153	164,530,170	173,206,513	+5	162,187,090	277,965,473	171,864,728	278,854,647	1.71	1.62	+6	20,740,187	22,081.972	+6

[1] 1926: Colorado, Georgia, Indiana, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oklahoma, Oregon, South Dakota, Utah, Virginia, Washington, West Virginia, and Wisconsin; 1927: Same States as in 1926, with Florida and Louisiana in addition.

[2] Began producing in September, 1927; shipping in October, 1927.

[3] Louisiana began producing in June, 1927; shipping in July, 1927.

The accompanying table, which shows production, shipments, and stocks of finished Portland cement by districts and by months for 1927, with totals by months for 1926, has been compiled from monthly reports on the operation of all but two plants each month; estimates have been included for the latter. Although the figures only approximate the totals shown by other tables, which are based on final annual reports from the producers, they reflect accurately the fluctuations in the industry during the year. In December, January, and February, in the colder part of the United States, the production of Portland cement is necessarily somewhat curtailed by the weather, as are also demand and hence shipments from the mills. In addition, mills often close for repairs during the winter, when the demand is lowest. As the quantity of clinker (unground cement) produced and in reserve at the mills awaiting manufacture into finished cement is of interest, the table appended shows these statistics, compiled from estimates by the manufacturers.

Summary of monthly estimates of Portland cement produced, shipped, and in stock at mills in the United States in 1927, by districts, in thousands of barrels

District	January	February	March	April	May	June	July	August	September	October	November	December
PRODUCTION												
Eastern Pennsylvania, New Jersey, and Maryland	2,510	2,353	2,997	3,640	4,040	4,091	4,090	4,255	4,058	3,799	3,345	2,941
New York	318	229	597	898	1,033	1,148	1,258	1,348	1,273	1,143	804	701
Ohio, western Pennsylvania, and West Virginia	563	865	1,262	1,409	1,558	1,716	1,909	1,967	1,804	1,746	1,542	970
Michigan	448	263	551	1,056	1,558	1,580	1,460	1,661	1,692	1,557	1,181	952
Wisconsin, Illinois, Indiana, and Kentucky	923	450	1,308	1,552	2,189	2,387	2,360	2,492	2,472	2,280	1,909	1,605
Virginia, Tennessee, Alabama, Georgia, Florida,[1] and Louisiana [2]	899	1,020	1,201	1,354	1,456	1,414	1,504	1,522	1,471	1,567	1,452	1,162
Eastern Missouri, Iowa, Minnesota, and South Dakota	509	404	714	982	1,440	1,467	1,509	1,585	1,481	1,572	1,411	1,247
Western Missouri, Nebraska, Kansas, and Oklahoma	468	236	753	964	1,037	994	964	943	1,033	1,109	883	713
Texas	383	396	465	469	462	469	458	496	487	532	525	514
Colorado, Montana, and Utah	121	65	118	210	246	268	239	216	174	187	176	113
California	974	888	1,179	1,177	1,364	1,322	1,264	1,399	1,200	1,388	1,048	902
Oregon and Washington	142	208	305	337	318	368	393	431	360	294	173	179
United States, 1927	8,258	7,377	11,450	14,048	16,701	17,224	17,408	18,315	17,505	17,174	14,449	11,999
1926	7,887	7,731	10,390	12,440	16,510	16,866	17,134	16,995	16,571	16,596	14,193	10,757
SHIPMENTS												
Eastern Pennsylvania, New Jersey, and Maryland	1,422	1,708	3,081	4,163	4,139	4,745	4,237	4,484	4,596	3,924	3,008	1,671
New York	165	215	481	843	961	1,307	1,263	1,514	1,468	1,171	741	402
Ohio, western Pennsylvania, and West Virginia	420	543	932	1,301	1,538	2,162	2,056	2,489	2,352	1,964	986	445
Michigan	261	334	596	963	1,431	1,804	1,674	2,146	1,869	1,560	757	317
Wisconsin, Illinois, Indiana, and Kentucky	464	652	1,198	1,623	2,336	3,086	2,935	3,119	2,564	2,579	1,284	544
Virginia, Tennessee, Alabama, Georgia, Florida,[1] and Louisiana [2]	921	992	1,220	1,385	1,453	1,357	1,465	1,628	1,490	1,505	1,325	786
Eastern Missouri, Iowa, Minnesota, and South Dakota	247	362	729	977	1,383	1,927	1,931	2,267	2,014	1,811	677	240
Western Missouri, Nebraska, Kansas, and Oklahoma	398	527	725	791	1,070	976	1,035	1,149	1,187	1,208	830	357
Texas	365	382	492	491	573	454	472	561	466	535	543	358
Colorado, Montana, and Utah	77	101	138	194	229	233	254	293	249	258	175	63
California	1,088	736	1,195	1,263	1,423	1,294	1,241	1,306	1,214	1,268	1,103	890
Oregon and Washington	140	179	313	356	329	416	421	455	359	322	190	127
United States, 1927	5,968	6,731	11,100	14,350	16,865	19,761	18,984	21,411	19,828	18,105	11,619	6,200
1926	5,674	5,820	9,539	12,965	17,973	19,134	18,812	18,583	18,087	17,486	11,276	6,432

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[1] Began producing in September, 1927; shipping in October, 1927.

[2] Louisiana began producing in June, 1927; shipping in July, 1927.

Summary of monthly estimates of Portland cement produced, shipped, and in stock at mills in the United States in 1927, by districts, in thousands of barrels—Continued

District	January	February	March	April	May	June	July	August	September	October	November	December
STOCKS (END OF MONTH)												
Eastern Pennsylvania, New Jersey, and Maryland	5,116	5,761	5,677	5,154	5,048	4,394	4,247	4,007	3,494	3,389	3,765	5,107
New York	1,438	1,453	1,568	1,624	1,695	1,536	1,531	1,365	1,170	1,142	1,205	1,529
Ohio, western Pennsylvania, and West Virginia	2,620	2,942	3,272	3,380	3,400	2,953	2,806	2,284	1,735	1,513	2,069	2,607
Michigan	2,093	2,019	1,975	2,068	2,195	1,971	1,743	1,257	1,080	1,077	1,501	2,205
Wisconsin, Illinois, Indiana, and Kentucky	3,441	3,239	3,348	3,277	3,131	2,432	1,857	1,231	1,139	885	1,512	2,614
Virginia, Tennessee, Alabama, Georgia, Florida,[1] and Louisiana [2]	1,167	1,197	1,178	1,144	1,146	1,206	1,251	1,145	1,126	1,178	1,304	1,682
Eastern Missouri, Iowa, Minnesota, and South Dakota	3,199	3,241	3,226	3,231	3,289	2,841	2,419	1,737	1,204	991	1,724	2,732
Western Missouri, Nebraska, Kansas, and Oklahoma	1,847	1,556	1,584	1,756	1,725	1,743	1,672	1,466	1,314	1,213	1,265	1,620
Texas	461	475	448	425	314	330	316	251	272	270	252	407
Colorado, Montana, and Utah	518	482	470	486	515	541	531	458	384	313	315	370
California	551	707	692	629	573	601	624	718	704	824	776	809
Oregon and Washington	463	491	484	480	472	424	400	373	374	346	334	400
United States, 1927	22,914	23,563	23,922	23,654	23,503	20,972	19,397	16,292	13,996	13,141	16,022	22,082
1926	20,582	22,385	23,236	22,710	21,255	19,000	17,301	15,718	14,188	13,334	16,243	[3] 20.740

[3] Revised figures.

Summary of monthly estimates of clinker (unground Portland cement) produced and in stock at mills in the United States in 1927, by districts, in thousands of barrels

District	January	February	March	April	May	June	July	August	September	October	November	December	Year
PRODUCTION													
Eastern Pennsylvania, New Jersey, and Maryland	2,867	2,745	3,394	3,452	3,686	3,692	3,783	3,967	3,792	3,744	3,402	3,051	41,575
New York	455	297	635	895	1,014	1,070	1,165	1,251	1,197	1,128	841	753	10,701
Ohio, western Pennsylvania, and West Virginia	834	719	1,194	1,423	1,523	1,528	1,576	1,689	1,596	1,697	1,631	1,332	16,742
Michigan	799	716	901	1,133	1,364	1,286	1,348	1,352	1,324	1,357	1,243	1,103	13,926

Wisconsin, Illinois Indiana, and Kentucky	1,337	1,073	1,448	1,710	2,027	1,988	2,026	2,114	2,125	2,164	1,926	1,828	21,766
Virginia, Tennessee, Alabama, Georgia, Florida,[1] and Louisiana [2]	986	1,068	1,211	1,416	1,439	1,363	1,389	1,434	1,478	1,516	1,431	1,246	15,977
Eastern Missouri, Iowa, Minnesota, and South Dakota	688	567	796	979	1,287	1,344	1,350	1,486	1,375	1,537	1,383	1,305	14,097
Western Missouri, Nebraska, Kansas, and Oklahoma	512	284	704	947	1,003	896	858	891	874	1,064	861	733	9,627
Texas	358	395	451	476	488	472	483	462	469	535	516	510	5,615
Colorado, Montana, and Utah	271	168	171	193	161	147	140	169	167	145	121	85	1,938
California	1,074	945	1,143	1,262	1,319	1,343	1,284	1,292	1,215	1,276	1,140	1,038	14,331
Oregon and Washington	229	276	349	360	366	308	295	289	319	306	203	193	3,493
United States, 1927	10,410	9,253	12,397	14,246	15,677	15,437	15,697	16,396	15,931	16,469	14,698	13,177	169,788
1926	10,416	9,477	11,655	12,967	15,005	15,125	15,381	15,585	15,162	15,720	14,384	12,587	163,464
STOCKS (END OF MONTH)													
Eastern Pennsylvania, New Jersey, and Maryland	1,272	1,695	2,129	1,996	1,745	1,407	1,172	974	772	766	877	1,001	----------
New York	469	538	579	580	570	505	426	344	283	281	341	399	----------
Ohio, western Pennsylvania, and West Virginia	1,803	1,663	1,608	1,634	1,611	1,422	1,108	855	667	634	732	1,100	----------
Michigan	954	1,409	1,765	1,850	1,668	1,383	1,280	984	628	440	505	745	----------
Wisconsin, Illinois, Indiana, and Kentucky	1,010	1,635	1,781	1,944	1,793	1,406	1,085	720	385	281	309	511	----------
Virginia, Tennessee, Alabama, Georgia, Florida,[1] and Louisiana [2]	719	787	816	897	903	870	773	704	727	691	689	756	----------
Eastern Missouri, Iowa, Minnesota, and South Dakota	680	843	931	942	809	732	592	515	424	408	400	474	----------
Western Missouri, Nebraska, Kansas, and Oklahoma	673	722	676	669	643	554	457	413	264	231	214	247	----------
Texas	130	134	125	138	169	177	208	180	168	179	176	180	----------
Colorado, Montana, and Utah	707	810	863	846	760	639	540	493	487	454	400	371	----------
California	1,114	1,175	1,143	1,233	1,190	1,233	1,434	1,332	1,348	1,242	1,354	1,491	----------
Oregon and Washington	458	532	581	606	653	598	534	373	337	353	377	385	----------
United States, 1927	9,989	11,943	12,997	13,335	12,514	10,926	9,609	7,887	6,490	5,960	6,374	7,660	----------
1926	9,074	10,931	12,290	12,967	11,695	10,144	8,604	7,362	6,112	5,370	5,763	7,799	----------

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[1] Began producing in September, 1927; shipping in October, 1927.

[2] Louisiana began producing in June, 1927; shipping in July, 1927.

The stock of Portland cement reported on hand at the mills increased each month in 1927 over the corresponding month in the preceding year, except in September, October, and November, when there were slight decreases. The stock at the end of the year, however, was 6 per cent higher than at the end of 1926 and was greater than at the end of any year during which official records of stock have been kept; it exceeded the average for the five preceding years (14,678,589 barrels) by over 50 per cent. The totals by States and districts are given in the preceding tables.

Finished Portland cement in stock at mills in the United States, December 31, 1918–1927, in barrels

1918	10, 451, 044	1923	10, 812, 639
1919	5, 256, 900	1924	14, 151, 695
1920	8, 833, 067	1925	18, 336, 173
1921	12, 192, 567	1926	[1] 20, 740, 187
1922	9, 352, 250	1927	22, 081, 972

DOMESTIC CONSUMPTION

The total consumption of Portland cement in the United States may be estimated by adding the imports to the shipments and subtracting the exports from the sum. Of course, at any time a variable but considerable quantity of cement is in transit, in warehouses at distributing points, and awaiting use at jobs, so that the estimate thus made is at best only approximate. Another fact that impairs the accuracy of the estimate is that the cement imported and exported is classed as hydraulic cement, hence the records do not discriminate between Portland and other cements and probably include some plaster also. Portland cement, however, constitutes by far the greater part of the exports. The apparent domestic consumption in 1927 showed an increase of 5 per cent as compared with the consumption in 1926.

Portland cement available for consumption in the United States, 1918–1927, in barrels

Year	Shipments	Imports	Exports	Available for consumption
1918	70, 915, 508	305	2, 252, 446	68, 663, 367
1919	85, 612, 899	8, 931	2, 463, 573	83, 158, 257
1920	96, 311, 719	524, 604	2, 985, 807	93, 850, 516
1921	95, 507, 147	122, 322	1, 181, 014	94, 448, 455
1922	117, 701, 216	323, 823	1, 127, 845	116, 897, 194
1923	135, 912, 118	1, 678, 636	1, 001, 688	136, 589, 066
1924	146, 047, 549	2, 010, 936	878, 543	147, 179, 942
1925	157, 295, 212	3, 655, 317	1, 019, 597	159, 930, 932
1926	162, 187, 090	3, 232, 386	974, 326	164, 445, 150
1927	171, 864, 728	2, 050, 180	816, 726	173, 098, 182

Furthermore, the only available gauge of consumption of Portland cement by States is the record of shipments into the several States by the manufacturers, and is therefore merely approximate. The shipments of cement into a State during a year do not equal the consumption in that State during the same year, but shipments over a long period should afford a fair index of consumption. The simplest available common unit is the estimated consumption in barrels per capita, which is obtained by comparing the shipments into the several

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[1] Revised figures.

States with the population of those States. The following table shows such figures for 1926 and 1927. The estimates of population used in calculating the per capita consumption are those of the Bureau of the Census.

The official figures for exports of cement on page 297 differ from the exports reported by manufacturers in the following table because cement forwarded from mills and destined for foreign countries and for Alaska, Hawaii, and Porto Rico is reported by the shipper as exported, whether or not it leaves the country during the calendar year; but the Bureau of Foreign and Domestic Commerce export figures record the cement that actually leaves the country during the period specified. (Shipments to Alaska, Hawaii, and Porto Rico appear on p. 296.) The exports for 1927 compiled by that bureau include all other hydraulic cement exported, whereas the table of per capita consumption relates only to Portland cement.

The per capita consumption indicated by the table necessarily falls short of the total apparent consumption by the quantity of the imports. These increase the consumption in certain States near the Canadian border and the seaboard; in 1927 they increased the general average per capita consumption by about 0.018 barrel.

In 28 States—11 west and 17 east of the Mississippi River—the per capita consumption in 1927 was 1 barrel or more. Three southern States—Florida, North Carolina, and Texas—are included in this class.

The highest per capita consumption in 1927 was that of California—2.96 barrels. In four other States—Michigan, New Jersey, Illinois, and New York—the per capita consumption in 1927 was 2 barrels or more. Iowa, Vermont, Washington, New Jersey, Oklahoma, and Wisconsin, in the order named, showed the largest per capita increases of the year. There were changes in all the States; 32 showed increases and 17 decreases. The general average consumption for the United States was 1.44 barrels in 1927 as compared with 1.37 barrels in 1926. The range from 1914 to 1926 was from 0.64 barrel in 1918 to 1.38 barrels[2] in 1925.

Shipments of domestic Portland cement from mills into States and per capita, 1926–27, in barrels[a]

State	1926		1927	
	Total	Per capita[a]	Total	Per capita[a]
Alabama	1,981,011	0.78	2,264,576	0.89
Arizona[b]	426,261	.96	562,460	1.23
Arkansas[b]	769,808	.40	855,051	.44
California	12,691,277	2.94	13,128,911	2.96
Colorado	1,138,301	1.07	1,002,396	.93
Connecticut[b]	1,856,786	1.16	2,061,892	1.26
Delaware[b]	360,193	1.50	342,905	1.41
District of Columbia[b]	967,342	1.72	981,732	1.82
Florida[c]	4,373,917	3.32	2,482,725	1.82
Georgia	1,831,276	.58	1,904,685	.60
Idaho[b]	443,737	.85	311,226	.58
Illinois	14,066,500	1.95	14,832,550	2.03

[a] Per capita figures based on estimate of population made by the Bureau of the Census.
[b] Noncement-producing State.
[c] Florida began producing in September, 1927; shipping in October, 1927.

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[2] Data on the per capita consumption of Portland cement by States, beginning with 1914, are given in previous volumes of Mineral Resources of the United States.

Shipments of domestic Portland cement from mills into States and per capita, 1926–27, in barrels—Continued

State	1926		1927	
	Total	Per capita	Total	Per capita
Indiana	5,174,533	1.66	5,738,557	1.82
Iowa	2,826,839	1.17	3,708,471	1.53
Kansas	2,286,661	1.26	2,432,055	1.33
Kentucky	1,659,087	.66	1,953,629	.77
Louisiana [d]	1,187,453	.62	1,490,560	.77
Maine [b]	548,155	.69	505,952	.64
Maryland	2,318,564	1.47	2,651,700	1.66
Massachusetts [b]	2,982,987	.71	2,820,132	.66
Michigan	10,784,049	2.45	11,576,188	2.58
Minnesota	3,572,711	1.35	3,380,002	1.26
Mississippi [b]	804,351	.45	980,791	.55
Missouri	5,261,961	1.49	4,207,151	1.20
Montana	257,741	.37	307,968	.43
Nebraska	1,554,967	1.12	1,360,032	.97
Nevada [b]	94,644	1.22	87,276	1.13
New Hampshire [b]	438,350	.97	459,706	1.01
New Jersey	7,116,109	1.93	8,419,323	2.25
New Mexico [b]	192,718	.50	278,528	.71
New York	20,224,702	1.79	23,002,585	2.01
North Carolina [b]	3,731,959	1.31	3,213,314	1.11
North Dakota [b]	402,546	.63	392,730	.61
Ohio	9,683,538	1.47	10,342,424	1.54
Oklahoma	2,343,201	1.00	3,119,565	1.31
Oregon	1,318,252	1.50	1,399,167	1.57
Pennsylvania	13,839,552	1.44	13,837,359	1.42
Rhode Island [b]	634,626	.92	700,851	1.00
South Carolina [b]	638,972	.35	985,874	.53
South Dakota	423,831	.62	409,820	.59
Tennessee	1,933,409	.78	2,262,697	.91
Texas	4,877,987	.92	5,437,907	1.01
Utah	461,338	.90	428,469	.82
Vermont [b]	271,615	.77	393,294	1.12
Virginia	1,733,734	.69	1,799,062	.71
Washington	2,021,986	1.31	2,574,293	1.65
West Virginia	1,679,574	1.01	1,561,978	.92
Wisconsin	4,621,975	1.60	5,553,176	1.90
Wyoming [b]	188,590	.80	181,103	.75
Unspecified	60,031	----------	51,818	----------
	160,939,707	1.37	170,736,616	1.44
Exports reported by manufacturers but not included above [e]	1,247,383	----------	1,128,112	----------
Total shipped from cement plants	162,187,090	----------	171,864,728	----------

[b] Noncement-producing State.
[d] Louisiana began producing in June, 1927; shipping in July, 1927.
[e] Includes shipments to Alaska, Hawaii, and Porto Rico.

LOCAL SUPPLIES

The following table compares the shipments from the mills within a State or group of States with the estimated consumption (State receipts of mill shipments) and indicates the surplus or deficiency in the supply of cement locally available. Consumption in the States that do not produce cement is also indicated in the preceding table. Data for 1916 to 1925 will be found in Mineral Resources of the United States for 1917 to 1925.

The surplus shown in the following table was distributed by years, as follows: In 1926, to noncement-producing States, 21,255,010 barrels; to foreign countries and to Alaska, Hawaii, and Porto Rico, 1,247,383 barrels; unspecified, 60,031 barrels. In 1927, to noncement-producing States, 16,114,817 barrels; to foreign countries and to Alaska, Hawaii, and Porto Rico, 1,128,112 barrels; unspecified, 51,818 barrels.

Estimated surplus or deficiency in local supply of Portland cement in cement-producing States, 1926-27, in barrels

State or division	1926			1927		
	Shipments from mills	Estimated consumption	Surplus or deficiency	Shipments from mills	Estimated consumption	Surplus or deficiency
Alabama	6,693,900	1,981,011	+4,712,889	7,313,494	2,264,576	+5,048,918
California	13,660,078	12,691,277	+968,801	14,433,153	13,128,911	+1,304,242
Illinois	6,977,598	14,066,500	−7,088,902	7,061,240	14,832,550	−7,771,310
Iowa	4,788,639	2,826,839	+1,961,800	5,661,234	3,708,471	+1,952,763
Kansas	6,150,694	2,286,661	+3,864,033	6,141,937	2,432,055	+3,709,882
Michigan	11,959,447	10,784,049	+1,175,398	13,708,259	11,576,188	+2,132,071
Missouri	7,639,966	5,201,961	+2,438,005	6,929,229	4,207,151	+2.722,078
New York	8,535,862	20,224,702	−11,688,840	10,531,092	23,002,585	−12,471,493
Ohio	7,422,720	9.683,538	−2,260,818	8,727,879	10,342,424	−1,614,545
Pennsylvania	41,395,604	13,839,552	+27,556,052	42,909,513	13,837,359	+29,072,154
Tennessee	5,053,528	1,933,409	+3,120,119	4,343,337	2,262,697	+2,080,640
Texas	5,042.359	4,877,987	+164,372	5,692,350	5,437,907	+254,443
Colorado, Montana, and Utah	2,457,303	1,857,380	+599,923	2,293,514	1,738,833	+554,681
Oregon and Washington	3,113,083	3,340,238	−227,155	3,605,103	3,973,460	−368,357
Georgia, Kentucky, Virginia, Florida,[1] and Louisiana [2]	3,824,722	5,224,097	−1,399,375	4,742,235	9,630,661	−4,888,426
Indiana, Wisconsin, Minnesota, Nebraska, Oklahoma, and South Dakota	19,895,575	17,691,218	+2,204,357	20,549,721	19,561,152	+988,569
Maryland, New Jersey, and West Virginia	7,576,012	11,114,247	−3,538,235	7,221,438	12,633,001	−5,411,563
	162,187,090	139,624,666	+22,562,424	171,864,728	154,569,981	+17,294,747

[1] Began producing in September, 1927; shipping in October, 1927.
[2] Louisiana began producing in June, 1927; shipping in July, 1927.

The following table, which shows by months during 1927 the shipments from Portland cement mills into States, has been compiled from monthly reports of producers but includes estimates of the distribution of shipments from three plants each month. Although the figures only approximate the totals shown in the other tables, which are based on final annual reports from the producers, they reflect the fluctuations in shipments during the year.

Portland cement shipped from mills into States in 1927, by months, in barrels [1]

Shipped to—	January	February	March	April	May	June
Alabama	132,569	127,020	141,921	173,893	164,359	155,252
Alaska	----------	132	305	1,037	2,514	1,823
Arizona	54,088	41,677	45,602	47,573	46,724	45,172
Arkansas	46,014	59,309	59,114	53,331	77,207	77,555
California	998,230	649,302	1,094,778	1,137,845	1,281,461	1,153,990
Colorado	28,050	45,006	47,912	86,431	109,671	95,029
Connecticut	34,587	58,534	109,035	179,863	193,315	255,970
Delaware	11,170	13,885	24,826	40,699	35,564	32,807
District of Columbia	50,552	59,964	95,396	89,048	79,566	87,224
Florida	283,031	285,604	290,682	271,575	234,914	199,406
Georgia	119,770	134,787	169,167	168,681	209,126	196,027
Hawaii	22,491	31,022	19,615	25,876	25,631	31,227
Idaho	15,085	27,495	35,047	32,063	26,767	29,085
Illinois	301,829	417,054	752,148	956,012	1,402,964	1,921,502
Indiana	74,589	143,650	274,774	418,874	561,019	739,188
Iowa	38,157	55,837	147,119	211,248	357,184	553,469
Kansas	68,122	107,823	166,110	203,368	294,596	243,653
Kentucky	42,851	78,183	113,474	148,567	188,319	201,477
Louisiana	116,633	122,629	134,893	107,023	116,352	119,191
Maine	6,295	5,422	20,132	39,031	49,870	67,820
Maryland	135,015	123,421	231,780	224,405	224,398	245,061
Massachusetts	70,354	81,457	193,283	293,606	289,218	320,541
Michigan	258,848	301,666	532,908	857,574	1,258,924	1,504,877
Minnesota	41,396	61,047	147,967	258,506	387,814	485,312

[1] Includes estimated distribution of shipments from 3 plants each month

Portland cement shipped from mills into States in 1927, by months, in barrels—Con.

Shipped to—	January	February	March	April	May	June
Mississippi	51, 325	62, 783	75, 149	78, 127	74, 061	76, 227
Missouri	113, 581	173, 365	287, 825	312, 311	409, 889	438, 193
Montana	7, 261	9, 845	19, 365	23, 882	24, 561	33, 243
Nebraska	22, 675	39, 594	81, 860	96, 255	155, 964	145, 564
Nevada	2, 724	3, 649	7, 665	10, 406	7, 495	12, 853
New Hampshire	16, 172	9, 599	25, 391	43, 932	38, 333	47, 672
New Jersey	227, 489	279, 739	611, 542	897, 645	894, 457	944, 454
New Mexico	12, 503	20, 957	32, 564	28, 566	31, 149	21, 991
New York	700, 414	855, 484	1, 511, 091	2, 131, 528	2, 188, 026	2, 869, 955
North Carolina	141, 582	168, 720	235, 316	324, 758	367, 215	325, 413
North Dakota	3, 575	3, 081	20, 429	38, 157	40, 034	74, 012
Ohio	226, 786	321, 218	579, 555	837, 050	966, 808	1, 309, 273
Oklahoma	164, 266	191, 130	235, 301	242, 747	309, 509	266, 615
Oregon	35, 715	53, 310	91, 820	122, 281	152, 050	172, 173
Pennsylvania	365, 107	476, 001	864, 655	1, 199, 544	1, 331, 265	1, 719, 593
Porto Rico	2, 550	1, 275	2, 500	1, 000	2, 250	1, 750
Rhode Island	19, 352	19, 874	50, 746	78, 743	77, 876	68, 486
South Carolina	42, 537	47, 821	71, 247	82, 680	87, 442	64, 616
South Dakota	5, 094	10, 170	31, 724	35, 465	38, 442	54, 405
Tennessee	86, 485	102, 871	137, 431	180, 574	217, 416	219, 588
Texas	362, 004	371, 525	481, 261	472, 879	545, 848	419, 994
Utah	13, 356	15, 527	25, 741	31, 793	32, 759	40, 344
Vermont	5, 606	4, 472	9, 397	30, 185	29, 715	42, 594
Virginia	62, 199	92, 723	124, 387	135, 226	168, 463	204, 817
Washington	104, 608	124, 266	229, 012	248, 518	223, 574	295, 426
West Virginia	47, 871	64, 296	96, 803	112, 009	141, 521	170, 166
Wisconsin	76, 148	100, 245	221, 345	356, 961	568, 828	869, 960
Wyoming	5, 972	7, 754	10, 293	14, 783	17, 531	25, 173
Unspecified	19, 886	18, 914	14, 748	102, 398	46, 626	16, 202
	5, 894, 569	6, 682, 134	11, 034, 151	14, 296, 532	16, 806, 584	19, 713, 410
Foreign countries	73, 431	48, 866	65, 849	53, 468	58, 416	47, 590
Total shipped from cement plants	5, 968, 000	6, 731, 000	11, 100, 000	14, 350, 000	16, 865, 000	19, 761, 000

Shipped to—	July	August	September	October	November	December
Alabama	207, 386	243, 841	229, 592	268, 221	252, 077	154, 744
Alaska	2, 029	338	742	------------	132	132
Arizona	38, 125	34, 598	38, 589	40, 461	52, 276	59, 318
Arkansas	72, 502	85, 164	87, 996	92, 180	85, 638	57, 068
California	1, 077, 710	1, 158, 661	1, 114, 333	1, 170, 744	1, 027, 706	824, 570
Colorado	113, 490	124, 628	107, 896	120, 300	74, 276	26, 601
Connecticut	258, 232	239, 392	257, 188	214, 120	170, 103	86, 509
Delaware	18, 765	40, 815	58, 667	34, 107	20, 630	11, 926
District of Columbia	105, 400	103, 217	100, 626	97, 408	70, 727	35, 714
Florida	166, 647	180, 328	152, 129	153, 713	142, 655	113, 291
Georgia	179, 713	193, 713	149, 740	153, 271	143, 624	82, 378
Hawaii	34, 500	28, 219	11, 790	23, 201	8, 726	15, 380
Idaho	28, 166	30, 000	29, 588	32, 774	16, 447	4, 441
Illinois	1, 962, 942	2, 066, 172	1, 902, 780	1, 892, 207	880, 391	354, 542
Indiana	771, 651	868, 669	807, 523	701, 944	289, 212	95, 766
Iowa	486, 109	602, 653	563, 779	527, 340	123, 547	23, 951
Kansas	263, 430	251, 022	261, 769	305, 427	218, 395	54, 211
Kentucky	239, 555	283, 184	245, 577	223, 764	114, 964	54, 727
Louisiana	147, 449	147, 709	129, 457	131, 902	110, 968	87, 776
Maine	82, 034	81, 018	63, 493	49, 167	30, 019	10, 808
Maryland	272, 142	366, 046	285, 248	258, 427	180, 358	79, 376
Massachusetts	290, 232	314, 527	310, 562	302, 248	237, 558	115, 909
Michigan	1, 360, 516	1, 788, 820	1, 459, 078	1, 270, 331	641, 339	288, 329
Minnesota	419, 976	480, 599	414, 197	345, 054	96, 509	31, 326
Mississippi	102, 252	111, 007	92, 276	105, 002	97, 083	54, 595
Missouri	481, 281	560, 364	489, 155	502, 478	305, 254	122, 327
Montana	39, 521	50, 776	43, 797	35, 507	14, 205	7, 359
Nebraska	150, 181	180, 063	195, 109	207, 301	58, 307	22, 265
Nevada	10, 139	6, 149	4, 845	5, 381	6, 789	7, 151
New Hampshire	50, 796	56, 223	66, 537	53, 052	34, 719	17, 676
New Jersey	844, 190	853, 588	960, 390	870, 585	672, 737	334, 897
New Mexico	18, 160	23, 750	23, 103	29, 552	23, 695	8, 557
New York	2, 467, 699	2, 749, 722	2, 703, 962	2, 119, 748	1, 514, 114	972, 156
North Carolina	321, 348	340, 093	303, 283	302, 904	264, 393	112, 711
North Dakota	71, 813	69, 872	35, 938	27, 700	5, 437	1, 503
Ohio	1, 166, 296	1, 381, 581	1, 406, 311	1, 284, 751	675, 806	265, 267
Oklahoma	287, 638	298, 452	329, 676	301, 163	319, 776	166, 309
Oregon	187, 401	188, 586	127, 909	122, 443	80, 653	51, 020
Pennsylvania	1, 573, 559	1, 706, 430	1, 683, 405	1, 413, 406	932, 367	482, 928
Porto Rico	3, 000	3, 500	------------	500	------------	------------
Rhode Island	69, 599	85, 312	76, 597	71, 567	58, 352	23, 034

Portland cement shipped from mills into States in 1927, by months, in barrels—Con.

Shipped to—	July	August	September	October	November	December
South Carolina	63, 414	103, 455	100, 262	112, 445	133, 046	76, 009
South Dakota	50, 896	50, 994	56, 882	57, 753	13, 870	1, 570
Tennessee	269, 184	285, 835	253, 945	231, 850	174, 923	96, 305
Texas	436, 475	533, 591	449, 994	523, 015	506, 726	320, 201
Utah	41, 478	60, 332	43, 021	41, 022	30, 046	13, 642
Vermont	45, 365	67, 255	71, 529	52, 392	21, 938	12, 675
Virginia	195, 133	211, 679	197, 320	181, 685	145, 820	76, 722
Washington	299, 400	335, 681	264, 748	220, 784	129, 611	94, 981
West Virginia	194, 693	239, 578	250, 542	205, 074	104, 307	42, 153
Wisconsin	858, 526	1, 035, 131	711, 004	541, 528	214, 907	89, 645
Wyoming	20, 374	22, 131	19, 223	15, 102	15, 407	7, 676
Unspecified	29, 843	23, 887	38, 986	1, 954	32, 465	405
	18, 948, 355	21, 348, 350	19, 782, 082	18, 045, 955	11, 575, 030	6, 150, 532
Foreign countries	35, 645	62, 650	45, 918	59, 045	43, 970	49, 468
Total shipped from cement plants	18, 984, 000	21, 411, 000	19, 828, 000	18, 105, 000	11, 619, 000	6, 200, 000

PRICES

AT FACTORIES

The average selling value of Portland cement f. o. b. at the factories, with the price of containers not included and with cash discounts deducted where allowed, as reported to the Bureau of Mines is shown in the table of shipments by States and districts during 1926 and 1927 (p. 273). The averages by districts ranged from $1.52 a barrel in the Virginia-Tennessee-Alabama-Georgia-Florida-Louisiana and the Michigan districts to $2.15 a barrel in the Oregon-Washington district in 1927, as compared with a range from $1.58 a barrel in the western Missouri-Nebraska-Kansas-Oklahoma district to $2.17 a barrel in the Oregon-Washington district in 1926. The general average value for the whole country decreased 9 cents per barrel, or 5 per cent, in 1927, and averages were lower in all the districts except western Missouri-Nebraska-Kansas-Oklahoma, and in all the States except Kansas.

For certain States the average factory value of Portland cement may be higher than it would be if the ordinary structural cement were the only kind considered. For these States certain special cements that command higher prices are included in the average. These special cements include the white Portland cement made in Pennsylvania and, beginning in 1927, in Tennessee as well, and the plastic and waterproofed Portland cements. The manufacture in California of cement characterized as plastic and waterproof and intended particularly for certain uses, such as shutting out water in oil wells, has been noted for some years in previous issues of this report. In 1927, the first year for which an attempt was made by the Bureau of Mines to collect separate statistics of special Portland cements, the manufacture and marketing of cement of marked plasticity and waterproofing qualities was reported in a number of other States. Statistics of output of plastic and waterproofed, high-early strength, and quick-hardening Portland cement in 1927 appear in the table on page 290.

Average factory value per barrel in bulk of Portland cement, 1916–1927

1916	$1. 10	1920	$2. 02	1924	$1. 81
1917	1. 35	1921	1. 89	1925	1. 77
1918	1. 60	1922	1. 76	1926	1. 71
1919	1. 71	1923	1. 90	1927	1. 62

AT MARKETS

The following table summarizes the wholesale prices of Portland cement in bulk in carload lots at the principal cities of the United States and at Montreal, Canada, for 1926 and 1927, by months, as published in the Engineering News-Record. Seeming inconsistencies in the table, such as sudden large changes in prices, suggest the inclusion of delivery charges that the explanatory footnote does not account for. The price figure may be compared in several different ways. Prices at a single locality for corresponding months in 1926 and 1927 and for the several months of the same year and prices at different localities can readily be compared. As with factory values, the net movement of market prices in 1927, as in 1926, was downward; the decreases were 1 to 65 cents a barrel.

As the annual per capita consumption of Portland cement in the United States has reached nearly 1½ barrels and promises to continue to increase the prices of such an essential building material have attracted particular interest. Considerable information is now available to show the position of cement prices among those of other structural materials and to explain the economic conditions that determine them. Data of interest in this connection are now compiled and published by the United States Department of Labor, Bureau of Labor Statistics.

Wholesale prices of Portland cement per barrel in bulk in carload lots, 1926–27, by months [1]

City	January		February		March		April		May		June	
	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927
Atlanta	$2.30	$2.35	$2.35	$2.25	$2.35	$2.35	$2.35	$2.35	$2.35	$2.35	$2.25	$2.35
Baltimore	2.50	2.50	2.50	2.50	2.35	2.50	2.50	2.50	2.35	2.50	2.35	2.50
Birmingham	2.40	2.40	2.40	2.30	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
Boston	2.40	2.35	2.40	2.35	2.40	2.35	2.40	2.25	2.40	2.25	2.35	2.30
Cedar Rapids	2.34	2.24	2.34	2.24	2.34	2.24	2.34	2.24	2.34	2.24	2.34	2.24
Chicago	2.10	2.10	2.10	2.05	2.10	2.05	2.10	2.05	2.10	2.05	2.10	2.05
Cincinnati	2.37	2.37	2.37	2.32	2.37	2.32	2.37	2.32	2.37	2.32	2.37	2.32
Cleveland	2.29	2.29	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24
Dallas	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05
Davenport	2.29	2.29	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24
Denver	2.84	2.85	2.84	2.85	2.84	2.85	2.84	2.85	2.85	2.85	2.85	2.85
Detroit	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15
Duluth	2.09	2.09	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04
Indianapolis	2.29	2.29	2.29	2.19	2.29	2.19	2.29	2.19	2.29	2.19	2.29	2.19
Jersey City	2.33	2.33	2.33	2.33	2.33	2.28	2.33	2.28	2.33	2.28	2.33	2.13
Kansas City	2.40	2.05	2.02	2.05	2.35	2.05	2.35	2.20	2.35	2.50	2.35	2.10
Los Angeles	2.52	2.50	2.52	2.50	2.52	2.50	2.52	2.50	2.36	2.50	2.36	2.56
Milwaukee	2.25	2.25	2.25	2.20	2.25	2.20	2.25	2.20	2.25	2.20	2.25	2.20
Minneapolis	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22
Montreal	1.80	1.15	1.80	1.15	1.80	1.15	1.80	1.15	1.42	1.15	1.42	1.36
New Orleans	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.30	2.40	2.30	2.40
New York (delivered)	2.50–2.70	2.50–2.60	2.50–2.70	2.35–2.50	2.50–2.70	2.35–2.50	2.50	2.35–2.50	2.50–2.60	2.35–2.50	2.50–2.60	2.35–2.50
New York (alongside dock to dealers)	2.15	2.15	2.15	2.03	2.15	2.03	2.15	2.03	2.15	2.03	2.15	2.03
Peoria	2.27	2.27	2.27	2.22	2.27	2.22	2.27	2.22	2.27	2.22	2.27	2.22
Philadelphia	2.60	2.50	2.60	2.50	2.41	2.50	2.41	2.50	2.41	2.50	2.41	2.40
Pittsburgh	2.09	2.09	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04
St Louis	2.20	2.20	2.20	2.05–2.20	2.20	2.05	2.20	2.05	2.20	2.05	2.20	2.05
St. Paul	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22
San Francisco	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.51	2.31	2.51	2.31	2.51
Seattle	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65
Toledo	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20

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[1] Engineering News-Record. Prices quoted are f. o. b. points listed, without bags; cash discount not deducted.

Wholesale prices of Portland cement per barrel in bulk in carload lots, 1926–27, by months—Continued

City	July		August		September		October		November		December	
	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927
Atlanta	$2.35	$2.40	$2.35	$2.40	$2.35	$2.40	$2.35	$2.40	$2.35	$2.45	$2.35	$2.45
Baltimore	2.35	2.50	2.35	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Birmingham	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
Boston	2.35	2.00	2.30	2.05	2.30	2.05	2.30	2.05	2.30	2.05	2.25	2.05
Cedar Rapids	2.34	2.24	2.34	2.24	2.34	2.24	2.34	2.24	2.34	2.24	2.34	2.24
Chicago	2.10	2.05	2.10	2.05	2.10	2.05	2.10	2.05	2.10	2.05	2.10	2.05
Cincinnati	2.37	2.32	2.37	2.32	2.37	2.36	2.37	2.32	2.37	2.32	2.37	2.32
Cleveland	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24
Dallas	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05
Davenport	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24	2.29	2.24
Denver	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
Detroit	2.15	2.15	2.15	2.15	2.15	2.20	2.15	2.00	2.15	2.00	2.15	2.00
Duluth	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04
Indianapolis	2.29	2.19	2.29	2.19	2.29	2.19	2.29	2.19	2.29	2.19	2.29	2.19
Jersey City	2.33	2.13	2.33	2.13	2.33	2.13	2.33	2.13	2.33	2.13	2.33	2.13
Kansas City	2.35	2.10	2.02	2.07	2.35	2.07	2.35	2.07	2.35	2.07	2.35	2.07
Los Angeles	2.30	2.56	2.30	2.56	2.36	2.56	2.36	2.56	2.20	2.56	2.50	2.56
Milwaukee	2.25	2.20	2.25	2.20	2.25	2.20	2.25	2.20	2.25	2.20	2.25	2.20
Minneapolis	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22
Montreal	1.15	2.22	1.15	2.22	1.15	2.22	1.15	1.41	1.41	1.41	1.41	1.41
New Orleans	2.30	2.40	2.30	2.50	2.30	1.97	2.30	2.07	2.30	2.32	2.40	2.07
New York (delivered)	2.50–2.60	2.35–2.50	2.50–2.60	2.35	2.50–2.60	2.35	2.50–2.60	2.35	2.50–2.60	2.35	2.50–2.60	2.25–2.35
New York (alongside dock to dealers)	2.15	2.03	2.15	2.03	2.15	2.03	2.15	2.03	2.15	2.03	2.15	2.03
Peoria	2.27	2.22	2.27	2.22	2.27	2.22	2.27	2.22	2.27	2.22	2.27	2.22
Philadelphia	2.41	2.40	2.41	2.40	2.41	2.40	2.41	2.40	2.41	2.40	2.50	2.40
Pittsburgh	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04	2.09	2.04
St. Louis	2.20	2.05	2.20	2.05	2.20	2.05	2.20	2.05	2.20	2.05	2.20	2.05
St. Paul	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22	2.32	2.22
San Francisco	2.31	2.51	2.31	2.51	2.31	2.51	2.31	2.51	2.31	2.51	2.31	2.51
Seattle	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65
Toledo	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20

Comparative prices of building materials in December, 1926 and 1927 [1]

[Percentage of increase or decrease from 1926 average]

	1926	1927
Building materials in general	−0.8	−9.6
Lime, building, at plant (composite price)	−.3	−1.9
Plate glass, 3 to 5 feet, New York	−4.6	−12.1
Turpentine, New York	−7.1	−41.6
Brick, common, building, at plant (composite price)	−.4	------------
Linseed oil, raw, New York	−3.8	−13.9
Douglas fir, No. 1, common, at mills	+2.5	−10.2
Yellow pine, flooring, at mills	−8.4	−21.2
Oak, plain white, No. 1, Cincinnati	+1.5	−8.4
Portland cement, at plant (composite price)	−.6	−3.5

[1] U. S. Department of Labor, Bureau of Labor Statistics, Wholesale Prices of Commodities: Report for December, 1927, pp. 10–11.

MANUFACTURING CONDITIONS

PLANTS

Portland cement was manufactured at 153 plants in 1927 and at 140 plants in 1926. Two plants which had been producing within the two previous years were idle in 1927. Fourteen new plants produced Portland cement in 1927; all of these except one, which is dry process, are reported as wet-process plants. They were equipped at the end of 1927 as follows:

Phoenix Portland Cement Corporation, plant at Phoenixville, Jefferson County, Ala. Wet process: Limestone, shale, and sandstone; clinker burned with coal; two 10 to 11¼ by 343¾ foot kilns; reported daily clinker capacity, 4,100 barrels.

Yosemite Portland Cement Corporation, plant at Merced, Merced County, Calif. Wet process: Limestone and clay; clinker burned with oil; two 10 by 240 foot kilns; reported daily clinker capacity, 2,500 barrels.

Colorado Portland Cement Co., plant at Boettcher, Larimer County, Colo. Dry process: Limestone and shale; clinker burned with natural gas and coal; waste-heat installation; two 11 by 175 foot kilns; reported daily clinker capacity, 3,500 barrels.

Florida Portland Cement Co., plant at Tampa, Hillsborough County, Fla. Wet process: Limestone and clay; clinker burned with coal; waste-heat installation; three 11 by 175 foot kilns; reported daily clinker capacity, 4,500 barrels.

Dewey Portland Cement Co., plant at Davenport, Scott County, Iowa. Wet process: Limestone and shale; clinker burned with coal; waste-heat installation; two 11 by 175 foot kilns; reported daily clinker capacity, 3,000 barrels.

Louisiana Portland Cement Co., plant at New Orleans, Orleans County, La. Wet process: Limestone, clay, and sandstone; clinker burned with coal; two 8 to 9 by 220 foot kilns; reported daily clinker capacity, 2,200 barrels.

Federal Portland Cement Co., plant at Buffalo, Erie County, N.Y. Wet process: Limestone and slag; clinker burned with coal; two 11 by 175 foot kilns; reported daily clinker capacity, 3,600 barrels.

Great Lakes Portland Cement Corporation, plant at Buffalo, Erie County, N. Y. Wet process: Limestone and clay; clinker burned with coal; four 11 by 250 foot kilns; reported daily clinker capacity, 7,000 barrels.

Valley Forge Cement Co., plant at West Conshohocken, Montgomery County, Pa. Wet process: Limestone and cement rock; clinker burned with coal; two 8⅚ to 9⅚ to 11⅚ by 223 foot kilns; reported daily clinker capacity, 2,800 barrels.

West Penn Cement Co., plant at West Winfield, Butler County, Pa. Wet process: Limestone, clay, shale, and sandstone; clinker burned with coal; one 11½ by 250 foot kiln; reported daily clinker capacity, 2,300 barrels.

Cumberland Portland Cement Co., plant at Cowan, Franklin County, Tenn. Equipped to manufacture both gray and white Portland cement. Wet process: Limestone and clay; clinker for gray cement burned with coal, for white cement burned with oil; two 10 by 150 foot kilns; reported daily clinker capacity, 2,200 barrels.

Trinity Portland Cement Co., plant at Houston, Harris County, Tex. Wet process: Oyster shells and clay; clinker burned with natural gas; one 11¼ by 300 foot kiln; reported daily clinker capacity, 1,700 barrels.

Basic Products Co., plant at Kenova, Wayne County, W. Va. Wet process: Limestone and clay; clinker burned with coal; one 8 by 120 foot kiln and one 8 by 135 foot kiln; reported daily clinker capacity, 1,050 barrels.

Standard Lime & Stone Co., plant at Martinsburg, Berkeley County, W. Va. Wet process: Limestone and shale; clinker burned with coal; one 10 to 11 by 175 foot kiln; reported daily clinker capacity, 1,000 barrels.

Additional plants were under construction but not completed in 1927 in Maine, Missouri, Nebraska, Pennsylvania, Tennessee, Washington, and Wyoming.

FUELS

The records show that 80.4 per cent of the Portland cement produced in 1927 was burned with coal alone as compared with 80.2 per cent in 1926, and that 7.3 per cent was burned with oil alone as compared with 8.9 per cent in 1926.

According to the reports of the cement producers, there were consumed at the Portland cement plants in the United States in 1927, in the production of 173,206,513 barrels of finished cement, the following quantities of fuel: Coal, 9,990,531 short tons; oil, 4,419,882 barrels (or 185,635,044 gallons); and natural gas, 23,640,250,515 cubic feet. In the estimates of consumption of fuel per barrel of cement in 1927 the production of finished cement alone is considered. It is of interest in this connection that the stock of clinker (unground cement) at the mills at the end of 1927—7,660,000 barrels—as shown in the tables on pages 277 and 288, very nearly offsets the stock of clinker at the mills at the end of 1926—7,799,000 barrels.

At the 123 plants in the United States where coal was reported as the only fuel used the apparent average consumption in 1927 was 135.8 pounds of coal per barrel of finished cement. Of these plants 65 were dry process and reported a total consumption of 5,983,141 short tons of coal in the manufacture of 94,606,073 barrels of finished cement, or an average consumption of 126.4 pounds of coal per barrel of finished cement. The 58 wet-process plants using coal alone as fuel reported a total consumption of 3,468,388 short tons of coal in the manufacture of 44,589,778 barrels of finished cement, or an average consumption of 155.6 pounds of coal per barrel of finished cement.

The use of oil alone as fuel in 1927 was reported by 13 plants, all west of the Mississippi River and, with one exception, all in Pacific Coast States. These plants reported a total consumption of 3,480,426 barrels of oil in the manufacture of 12,686,167 barrels of finished cement or an average of 0.2743 barrel (11½ gallons) of oil per barrel of finished cement; in other words, 1 barrel of oil burned 3.6 barrels of cement. The average consumption of oil by the dry-process plants was 0.2644 barrel (or 11.1 gallons) per barrel of finished cement, and by the wet-process plants 0.2869 barrel (12 gallons) per barrel of finished cement. The use of oil was reported at 12 additional plants which also used other fuel. Two of these plants are east and 10 west of the Mississippi River.

At the four plants in the United States reporting natural gas as the only fuel used in 1927 the average consumption was 2,450.5 cubic feet of gas per barrel of finished cement. The use of natural gas was reported by 11 additional plants which also used other fuel.

Portland cement burned in 1927, by kinds of fuel

Fuel	Finished cement produced			Fuel consumed		
	Number of plants	Barrels of 376 pounds	Per cent of total	Coal (short tons)	Oil (barrels of 42 gallons)	Natural gas (cubic feet)
Coal	123	[1] 139,195,851	80.4	[2] 9,451,529		
Oil	13	[1] 12,686,167	7.3		3,480,426	
Natural gas	4	[1] 3,049,663	1.8			7,473,251,400
Coal and oil	2	18,274,832	10.5	539,002	939,456	16,166,999,115
Coal and natural gas	1					
Oil and natural gas	6					
Coal, oil, and natural gas	4					
	153	173,206,513	100.0	[3] 9,990,531	4,419,882	23,640,250,515

[1] Average consumption of fuel per barrel of cement produced was as follows: Coal, 135.8 pounds; oil, 0.2743 barrel; natural gas, 2,450.5 cubic feet.

[2] In addition to the coal shown for this group, one of the plants reports using some petroleum coke with coal.

[3] Includes 212,842 short tons of anthracite and 9,777,689 short tons of bituminous coal.

The following table shows the total fuels used and the finished cement produced by the wet and dry processes in 1927.

Portland cement burned and fuels used in 1927, by processes

Process	Finished cement produced			Fuel consumed		
	Number of plants [1]	Barrels	Per cent of total	Coal (short tons)	Oil (barrels)	Natural gas (cubic feet)
Wet [2]	77½	58,872,750	34	3,488,239	1,871,247	16,080,680,715
Dry	75½	114,333,763	66	[3] 6,502,292	2,548,635	7,559,569,800
	153	173,206,513	100	[4] 9,990,531	4,419,882	23,640,250,515

[1] A wet mill and a dry mill in 1 plant are each counted as half a plant.

[2] Includes 1 semiwet plant.

[3] In addition to the coal shown for this group, 1 of the plants reports using some petroleum coke with coal.

[4] Includes 212,842 short tons of anthracite and 9,777,689 short tons of bituminous coal.

Estimated clinker (unground cement) produced in 1927 and in stock at mills at end of 1926 and 1927, by processes, in barrels

Process	Number of plants in 1927 [1]	Production in 1927	Stocks (Dec. 31)	
			1926	1927
Wet [2]	77½	58,005,000	4,274,000	3,189,000
Dry	75½	111,783,000	3,525,000	4,471,000
	153	169,788,000	7,799,000	7,660,000

[1] A wet mill and a dry mill in 1 plant are each counted as half a plant.

[2] Includes 1 semiwet plant.

CAPACITY

The capacity at the end of 1927 for production of finished Portland cement of the 153 plants active in 1927 and of 2 plants idle in 1927 but producing within the two previous years, according to manufacturers' reports supplemented by a few estimates, was 227,080,000 barrels per year. This total includes, besides the increased capacity due to extensions and improvements at old plants, approximately 13,863,000 barrels capacity for finished Portland cement of the 14 new plants completed during the year. The total production for 1927 was 76.3 per cent of the indicated capacity, based on producers' reports, at the close of the year; the corresponding figure for 1925 was 83.5 per cent. The figure for 1926, based on estimates of capacity made by the Bureau of Mines and published in the report of this series for 1926, was 76.4 per cent.

Portland cement manufacturing capacity of the United States in 1927, by districts

District	Estimated capacity (barrels)	Per cent of capacity utilized
Eastern Pennsylvania, New Jersey, and Maryland	47,074,000	90.7
New York	15,760,000	68.4
Ohio, western Pennsylvania, and West Virginia	23,260,000	74.5
Michigan	18,591,000	75.1
Wisconsin, Illinois, Indiana, and Kentucky	26,161,000	84.2
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	21,846,000	73.3
Eastern Missouri, Iowa, Minnesota, and South Dakota	20,357,000	70.5
Western Missouri, Nebraska, Kansas, and Oklahoma	14,013,000	72.0
Texas	7,230,000	78.2
Colorado, Montana, and Utah	5,592,000	39.0
California	21,813,000	66.8
Oregon and Washington	5,383,000	65.7
	227,080,000	76.3

The following estimates of relation between the production of finished Portland cement and the manufacturing capacity of the industry for each month in 1927 and for the 12 months ending with each month, based on the monthly reports of the producers, indicate the seasonal changes in the utilization of capacity. These estimates include, besides the increases in production and capacity due to improvements at old plants, the production and capacity of the new plants put into operation during the period covered by the estimates. The new plants for 1927 are listed on pages 286 to 287.

Ratio (per cent) of finished Portland cement produced to manufacturing capacity in 1927

	Monthly	12 months ended—
January	45.1	76.4
February	44.6	76.2
March	61.9	76.0
April	78.1	76.3
May	88.9	75.5
June	93.1	74.3
July	90.4	73.9
August	94.5	74.0
September	92.6	72.3
October	87.4	73.6
November	75.9	73.7
December	60.7	76.2

SPECIAL CEMENTS

In line with the increasing demand for cement of certain pronounced qualities or characteristics, such as greater plasticity and high-early strength, quick-hardening, and waterproofing qualities for special needs or uses, there are now being manufactured and put on the market in increasing quantity in the United States a number of types of cement in addition to the standard or "ordinary" Portland cement. As stated, such special cements as the white Portland cement and the plastic and waterproofed Portland cement have long been produced and marketed in the United States and have been included in the statistics in Mineral Resources. Alumina cement, a hydraulic cement noted especially for attaining high strength at early periods, has been manufactured in the United States for some years.

Among the natural cements, which are noted for their plasticity and are much used in masonry, the producers now report "mixed" and "improved" cements.

The result of an attempt by the Bureau of Mines to ascertain the extent to which special cements of the Portland class were manufactured in the United States in 1927 shows a production of 3,119,233 barrels and shipments of 2,784,860 barrels, valued at $5,269,741. These figures do not include statistics of white Portland cement, as the Bureau of Mines is not at liberty to publish such figures separately. Companies reported the manufacture of special cements at 27 plants in 12 States in 1927. The statistics are shown separately in the following table; they are included in the general statistics for Portland cement throughout this report.

Although a cement classified in one group may have qualities or characteristics by which another group is designated (for example, a high-early strength Portland cement which is also plastic), the grouping in the table follows the name or characteristic reported by the producer.

Special Portland cements reported produced and shipped in the United States in 1927, by types [1]

Type	Number of plants reporting	Production (barrels)	Shipments		
			Barrels	Value	Average factory value per barrel
High-early strength and quick-hardening Portland cement	10	1,615,884	1,344,815	$2,286,347	$1.70
Plastic and waterproofed Portland cement [2]	18	1,503,349	1,440,045	2,983,394	2.07

[1] Classified according to names or characteristics reported by the producers.
[2] Includes so-called "Oil-well," "Plastite," and "Super" Portland cements.

MASONRY, NATURAL, AND PUZZOLAN CEMENTS

The term "masonry cement" is used here to designate certain cements made, like natural cements, by grinding calcined calcareous rock and being used largely in mortar for laying brick and stone, although other hydraulic cements are also suitable for masonry.

Natural cement, including masonry cement, was produced in 1927 in 10 plants, situated as follows: Utica, Ill.; Speed, Ind.; Fort Scott, Kans.; Kosmosdale, Ky.; Austin and Mankato, Minn.; Brixment and Rosendale, N. Y.; Lisbon, Ohio; and Siegfried, Pa.

One manufacturer with a plant at Birmingham, Ala., reports an output of puzzolan or slag-lime cement, and in order that this output may be included in the cement totals for the United States without disclosure it is included with the statistics of masonry and natural cements.

The next table, which gives figures on the output of masonry, natural, and puzzolan cements in 1926 and 1927, indicates an increase in the shipments from the mills of 6 per cent in quantity and 2 per cent in gross value in 1927 as compared with 1926. Stocks at the mills were 19 per cent lower at the end of 1927 than at the end of 1926. The average factory value per barrel of the cement shipped from the mills in 1927 was $1.33, as compared with $1.39 in 1926. The output has been expressed in terms of 376-pound barrels to correspond with the statistics for Portland cement.

The second table presents quoted wholesale prices of these cements in lots of 500 barrels or more, exclusive of bags, f. o b. at a number of widely separated cities in the United States, as published by the Engineering News-Record; but in order to make a consistent comparison of these prices the reader should note that barrels of 240, 250, 260, 265, 300, 320, and 340 pounds are involved instead of the standard Portland cement barrel of 376 pounds. These cements are packed four sacks to the barrel, each sack holding about 1 cubic foot, as with Portland cement, but the lower specific gravity of the non-Portland cements accounts for their lighter weight per barrel.

Producers reported that 47,553 short tons of coal was consumed in 1927 in the manufacture of these cements; in addition they reported the use of small quantities of coke, oil, and gas having a total fuel value equivalent to approximately 440 short tons of coal.

At natural cement plants in the United States where coal was reported as the only fuel used the average consumption in 1927 was 54 pounds of coal per barrel (376 pounds) of cement.

Masonry, natural, and puzzolan cements produced, shipped, and in stock in the United States, 1926–27

Year	Production		Shipments		Stock (Dec. 31)
	Active plants	Barrels of 376 pounds	Barrels of 376 pounds	Value	Barrels of 376 pounds
1926	11	2,104,891	2,031,851	$2,820,110	[1] 181,928
1927	11	2,123,868	2,158,323	2,881,029	147,473

[1] Revised figures.

Wholesale prices of masonry, natural, and puzzolan cements, 1926–27, by months[1]

[Per barrel except as otherwise noted [2]]

City and brand	January		February		March		April		May		June		July		August		September		October		November		December	
	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927
Birmingham (Magnolia)	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40	$2.40
Boston (Rosendale)	2.65	2.75	2.65	2.75	2.65	2.75	2.65	2.75	2.60	2.75	2.60	2.75	2.60	2.00	2.60	2.00	2.60	2.00	2.65	2.25	2.65	2.25	2.65	2.35
Cincinnati (Utica)	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72
Kansas City (Fort Scott)	1.35	1.45	1.35	1.45	1.45	1.45	2.20	1.45	1.35	1.45	1.50	1.35	1.50	1.45	1.50	1.35	1.45	1.35	1.45	1.35	1.45	1.35	1.40	1.35
Minneapolis (Rosendale)	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
St. Louis (Carney)	2.50	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.75	2.85	2.75	2.35	2.75	2.35	2.85	2.35	2.85	2.25	2.85	2.35	2.85	2.35	2.60

[1] Engineering News-Record. Price to dealers per barrel for 500 barrels or more f. o. b., exclusive of bags.

[2] Available information indicates that the weights per barrel of these cements are as follows: Rosendale, 300 pounds; Utica, 240 and 265 pounds; Fort Scott, 240 pounds; Carney, 250 pounds; Magnolia (puzzolan cement), 320 pounds.

IMPORTS AND EXPORTS[3]

IMPORTS

The quantities given in the following tables of imports include hydraulic cement of all kinds. Some of the cement imported evidently was not manufactured in the country from which it was shipped to the United States.

The imports of hydraulic cement into the United States in 1927—2,050,180 barrels—show a decrease of 36.6 per cent from 1926, as compared with a decrease of 11.6 per cent in 1926 from 1925; these are the only annual decreases recorded in imports since 1921. In the imports, by countries, the decrease was quite general. Imports (209,178 barrels) from Norway, however, were nearly four and one-half times those of 1926; 151,559 barrels of the Norwegian total were received in South Carolina. The imports, by countries, were approximately as follows: From Belgium, 1,487,000 barrels (nearly 73 per cent of the total imports); Denmark, 239,000 barrels; Norway, 209,000 barrels; United Kingdom, 55,000 barrels; Canada, 24,000 barrels; and other countries, 36,000 barrels. The districts into which more than 300,000 barrels were imported in 1927 were the same as those receiving the largest quantities in 1926; in order of quantity in 1927 they are as follows: Massachusetts, Porto Rico, Florida, and Philadelphia. The total quantity imported into these four districts and into South Carolina (fifth in order) was nearly 79 per cent of the total imports into the United States in 1927. The average of the values assigned to the imports, which are supposed to represent the values in the foreign countries from which the material is exported, including the cost of the containers or coverings, was $1.44, a decrease of 15 cents per barrel compared with 1926.

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[3] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

The tariff act of 1922 put hydraulic cements on the free list, with the proviso that if any country imposes a duty on such cement coming from the United States an equal duty shall be imposed upon such cement coming into the United States from that country.

Roman, Portland, and other hydraulic cements imported into the United States, 1926–27, by countries

[General imports]

Country	1926		1927	
	Barrels	Value	Barrels	Value
Belgium	2,407,220	$3,740,156	1,487,014	$2,083,524
Canada	59,491	83,713	24,317	55,556
Chile	----------	----------	6	10
Cuba	441	1,484	----------	----------
Denmark	414,811	687,389	238,663	354,509
Dominican Republic	----------	----------	179	784
Estonia	74,254	161,208	----------	----------
Finland	1,197	2,309	----------	----------
France	73,729	105,157	6,438	12,960
Germany	9,199	10,804	7,623	10,442
Greece	(1)	5	----------	----------
Japan	24,092	44,825	17,500	34,292
Netherlands	14,077	26,209	4,257	6,487
Norway	47,374	77,489	209,178	294,049
Soviet Russia in Europe	21,113	43,228	3	30
Sweden	30	322	----------	----------
United Kingdom	85,358	141,102	55,002	103,808
	3,232,386	5,125,400	2,050,180	2,956,451

[1] Less than 1 ton; number of barrels not recorded.

Roman, Portland, and other hydraulic cements imported into the United States, 1926–27, by districts

[General imports]

District	1926		1927	
	Barrels	Value	Barrels	Value
Alaska	----------	----------	5	$25
Buffalo	161	$602	----------	----------
Connecticut	8,448	13,479	----------	----------
Florida	977,915	1,577,594	308,682	420,286
Galveston	17,706	25,734	18,328	24,908
Georgia	----------	----------	20,000	30,080
Hawaii	73,128	113,923	37,326	61,356
Los Angeles	46,391	76,640	11,278	18,770
Maine and New Hampshire	80,253	144,352	42,602	72,179
Maryland	250	465	500	809
Massachusetts	613,211	896,473	481,541	649,686
Michigan	54	77	----------	----------
Mobile	101,384	156,533	----------	----------
New Orleans	254,216	370,384	55,031	80,925
New York	74,402	168,362	39,423	67,317
Oregon	67,420	101,899	31,620	43,269
Philadelphia	430,372	709,459	305,920	425,485
Porto Rico	316,484	509,161	319,653	511,399
Rhode Island	----------	----------	80,156	108,627
Sabine	----------	----------	8,000	15,500
St. Lawrence	11,444	23,529	16,242	38,632
San Francisco	31,527	43,020	38,007	50,431
South Carolina	8,984	13,433	196,571	279,801
Vermont	1,513	2,969	1,518	2,293
Virginia	----------	----------	5,974	9,666
Washington	117,123	177,312	31,803	45,007
	3,232,386	5,125,400	2,050,180	2,956,451

Roman, Portland, and other hydraulic cements imported into the United States in 1927, by countries and districts

[General imports]

Country and district	Barrels	Value
Belgium:		
Florida	308, 532	$420, 086
Galveston	18, 328	24, 908
Georgia	20, 000	30, 080
Hawaii	19, 826	27, 064
Los Angeles	6, 065	8, 520
Maine	36, 050	57, 573
Massachusetts	469, 209	629, 479
New Orleans	47, 674	70, 328
New York	18, 566	23, 254
Oregon	29, 625	39, 769
Philadelphia	242, 306	345, 339
Porto Rico	65, 478	124, 447
Rhode Island	80, 156	108, 627
Sabine	8, 000	15, 500
San Francisco	35, 435	47, 102
South Carolina	45, 012	58, 955
Virginia	5, 949	9, 620
Washington	30, 803	42, 873
	1, 487, 014	2, 083, 524
Canada:		
Alaska	5	25
Maine and New Hampshire	6, 552	14, 606
St. Lawrence	16, 242	38, 632
Vermont	1, 518	2, 293
	24, 317	55, 556
Chile: New York	6	10
Denmark:		
New York	2, 626	8, 976
Philadelphia	11, 813	14, 763
Porto Rico	224, 224	330, 770
	238, 663	354, 509
Dominican Republic: Porto Rico	179	784
France:		
New Orleans	447	2, 126
New York	3, 419	7, 505
San Francisco	2, 572	3, 329
	6, 438	12, 960
Germany:		
Los Angeles	2, 213	$4, 866
Maryland	(1)	5
New Orleans	5, 410	5, 571
	7, 623	10, 442
Japan: Hawaii	17, 500	34, 292
Netherlands: Porto Rico	4, 257	6, 487
Norway:		
Los Angeles	2, 000	2, 315
Massachusetts	5, 000	8, 340
New York	2, 621	3, 643
Philadelphia	47, 973	58, 859
South Carolina	151, 559	220, 846
Virginia	25	46
	209, 178	294, 049
Soviet Russia in Europe: New York	3	30
United Kingdom:		
Florida	150	200
Los Angeles	1, 000	3, 069
Maryland	500	804
Massachusetts	7, 332	11, 867
New Orleans	1, 500	2, 900
New York	12, 182	23, 899
Oregon	1, 995	3, 500
Philadelphia	3, 828	6, 524
Porto Rico	25, 515	48, 911
Washington	1, 000	2, 134
	55, 002	103, 808
	2, 050, 180	2, 956, 451

[1] Less than 1 ton; number of barrels not recorded.

In addition to the imports shown in the preceding tables, "white nonstaining Portland cement" was recorded as "imported for consumption," as follows: 1926, 11,837 barrels, valued at $29,526; 1927, 15,800 barrels, valued at $50,657. The source of these imports, by countries, is not recorded; the figures are included in those shown in the following table.

Hydraulic cement imported for consumption in the United States, 1918–1927

Year	Barrels[1]	Value	Year	Barrels[1]	Value
1918	305	$1, 200	1923	1, 767, 264	$3, 145, 977
1919	8, 931	52, 636	1924	2, 023, 663	3, 139, 788
1920	524, 604	1, 254, 729	1925	3, 667, 458	5, 836, 482
1921	122, 317	388, 842	1926	3, 244, 223	5, 154, 926
1922	355, 931	692, 429	1927	2, 065, 730	3, 007, 103

[1] Barrels of 376 pounds in 1920 to 1927 and 380 pounds in earlier years.

EXPORTS

In 1927 the hydraulic cement exported to foreign countries and to the Philippine Islands and the Virgin Islands of the United States, most of it Portland cement, decreased 16 per cent in quantity and 6.6 per cent in value as compared with 1926. The quantity exported in 1927 was 0.5 per cent of the total shipments of hydraulic cement from mills during the year. The average value at the ports of export was $3.42 a barrel, as compared with $3.07 in 1926.

The destinations of exports were approximately as follows: To South America, 353,000 barrels; Central America, 120,000 barrels; Cuba, 107,000 barrels; other West Indies and Bermuda, 69,000 barrels; Mexico, 79,000 barrels; Canada, 24,000 barrels; and other countries, 65,000 barrels. The export trade varies from year to year but has never reached large proportions; it has not reached 2,000,000 barrels since 1920. During recent years strong competition from manufacturers in Europe, where labor costs are much lower than in the United States, has restricted the foreign market for American cement.

Hydraulic cement exported from the United States, 1926–27, by countries

Country	1926		1927	
	Barrels	Value	Barrels	Value
North America:				
Canada	17, 746	$82, 477	24, 103	$112, 741
Central America—				
British Honduras	14	126	31	146
Costa Rica	1, 776	6, 334	1, 945	7, 140
Guatemala	3, 152	10, 710	5, 666	17, 261
Honduras	19, 171	47, 998	16, 487	42, 973
Nicaragua	2, 331	6, 308	1, 795	5, 248
Panama	49, 211	143, 582	92, 245	275, 287
Salvador	5, 685	18, 593	2, 010	8, 856
Mexico	121, 546	363, 145	78, 516	254, 214
Miquelon, Langley, and St. Pierre Islands	------------	------------	100	580
Newfoundland and Labrador	14	81	123	611
West Indies—				
British—				
Barbados	6	36	12	77
Bermuda	7, 241	18, 191	5, 326	14, 753
Jamaica	41	232	159	1, 128
Trinidad and Tobago	108	950	210	1, 458
Other British	23, 183	55, 544	11, 363	26, 471
Cuba	134, 495	323, 328	107, 020	279, 957
Dominican Republic	8, 920	26, 511	3, 513	13, 620
Netherland	7, 527	17, 975	3, 321	12, 469
French	------------	------------	10	29
Haiti	35, 696	74, 832	44, 639	91, 970
Virgin Islands of the United States	5	11	84	250
South America:				
Argentina	43, 110	247, 076	49, 279	290, 879
Bolivia	441	2, 457	------------	------------
Brazil	12, 557	71, 719	15, 222	89, 243
Chile	32, 159	86, 491	15, 723	48, 037
Colombia	75, 212	186, 679	56, 920	169, 686
Ecuador	6, 112	17, 114	3, 793	12, 776
Guiana—				
British	41	259	------------	------------
Dutch	4, 100	12, 918	500	1, 575
French	165	437	330	841
Peru	17, 596	49, 035	14, 030	40, 406
Uruguay	27, 503	90, 183	77, 852	226, 129
Venezuela	262, 192	724, 751	119, 243	370, 686
Europe:				
Azores and Madeira Islands	10	65	2, 460	5, 651
Belgium	1	6	6	35
Denmark	81	530	231	1, 730
France	2	27	------------	------------
Germany	1, 525	7, 514	2, 134	12, 218

Hydraulic cement exported from the United States, 1926–27, by countries—Contd.

Country	1926		1927	
	Barrels	Value	Barrels	Value
Europe—Continued.				
Greece	235	$1,422	195	$1,164
Irish Free State	155	578	150	873
Italy	300	1,779	4	24
Netherlands	328	2,199	119	777
Norway	283	1,945	400	2,501
Poland and Danzig	30	186	-----	-----
Portugal	-----	-----	110	847
Rumania	-----	-----	107	1,000
Spain	1,820	10,742	1,725	10,192
Sweden	30	195	48	301
United Kingdom	33,808	184,267	36,068	214,535
Asia:				
China	1,223	7,300	1,432	8,444
East Indies—				
British—				
Ceylon	100	590	10	66
India	1,992	11,780	2,800	16,411
Malaya	2,743	16,562	3,570	21,096
Dutch—				
Java and Madura	628	3,441	910	5,089
Other Dutch	5	25	-----	-----
Hong Kong	307	1,923	50	300
Iraq	-----	-----	90	540
Japan	415	3,525	983	6,175
Palestine and Syria	775	4,582	375	2,214
Philippine Islands	370	3,002	1,164	7,080
Siam	25	160	50	318
Africa:				
British—				
East	300	2,244	270	1,643
South	240	1,513	268	1,689
West	96	257	-----	-----
Canary Islands	10	64	-----	-----
Egypt	10	60	125	723
French—Other	-----	-----	250	637
Italian	8	24	-----	-----
Liberia	-----	-----	104	495
Portuguese—				
Mozambique	-----	-----	170	1,086
Other Portuguese	164	968	38	203
Oceania:				
British—				
Australia	5,111	29,361	5,161	30,400
New Zealand	1,937	10,396	3,551	22,603
Other British	70	224	8	100
French	133	294	20	60
	974,326	2,995,833	816,726	2,796,717

Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, 1926–27

	1926		1927	
	Barrels	Value	Barrels	Value
Alaska	19,003	$59,198	19,517	$59,815
Hawaii	189,885	431,279	296,639	710,730
Porto Rico	82,020	194,491	103,741	256,179
	290,908	684,968	419,897	1,026,724

Hydraulic cement exported from the United States, 1918–1927

Year	Barrels	Value	Per cent of total shipments from mills	Year	Barrels	Value	Per cent of total shipments from mills
1918	2, 252. 446	$5, 912, 166	3. 2	1923	1, 001, 688	$2, 944, 174	0. 7
1919	2, 463, 573	7, 513, 389	2. 9	1924	878, 543	2, 615, 154	. 6
1920	2, 985, 807	10, 045, 369	3. 1	1925	1, 019, 597	3, 003, 128	. 6
1921	1, 181, 014	4, 276, 986	1. 2	1926	974, 326	2, 995, 833	. 6
1922	1, 127, 845	3, 206, 201	1. 0	1927	816, 726	2, 796, 717	. 5

CEMENT PRODUCTION IN CANADA

The total mill output of Portland cement in Canada in 1927 was 9,928,676 barrels, according to the Dominion Bureau of Statistics. The shipments amounted to 10,065,865 barrels, valued at $14,391,897, compared with 8,707,021 barrels, valued at $13,013,283, in 1926, an increase of 15.6 per cent in quantity and of 10.6 per cent in value. The average selling price over the whole Dominion, computed from the total quantity sold and the total value as given, was $1.43 a barrel in 1927 and $1.49 a barrel in 1926.

The apparent consumption of cement in Canada in 1927 increased 16.5 per cent over that in 1926. Imports in 1927 amounted to 19,354 barrels, having an average value of $4.52 a barrel, as compared with an average of $3.69 a barrel in 1926. Exports of Portland cement amounted to 249,694 barrels, with an invoiced value of $308,144.

Summary statistics of the cement industry in Canada, 1926–27 [1]

	1926		1927	
	Barrels	Value	Barrels	Value
Output	9, 041, 411	----------	9, 928, 676	----------
Sold or used	8, 707, 021	$13, 013, 283	10, 065, 865	$14, 391, 897
Stocks, Dec. 31	1, 609, 313	----------	1, 470, 624	----------
Imports:				
Portland	21, 114	77, 866	19, 354	87, 541
Manufactures	----------	18, 813	----------	17, 879
Exports	285, 932	358, 231	249, 694	308, 144
Apparent consumption	8, 442, 203	----------	9, 835, 525	----------

[1] Dominion Bureau of Statistics.

Cement is produced in Quebec, Ontario, Manitoba, Alberta, and British Columbia. Quebec mills led in shipments in 1927, accounting for 46 per cent of the total quantity reported as sold, and Ontario followed with 37 per cent.

The average selling price a barrel f. o. b. plant, by Provinces, in 1927 was as follows: Quebec, $1.16; Ontario, $1.37; Manitoba, $2.50; Alberta, $2.17; and British Columbia, $2.26.

The following table shows sales from mills in 1926 and 1927, by Provinces.

Cement sold by Canadian mills, 1926–27, by Provinces [1]

Province	1926		1927	
	Barrels	Value	Barrels	Value
Quebec	3,727,377	$4,535,386	4,636,751	$5,383,058
Ontario	3,398,860	4,792,857	3,751,786	5,144,326
Manitoba	612,155	1,572,401	551,698	1,378,121
Alberta	423,766	873,621	601,699	1,303,880
British Columbia	544,863	1,239,018	523,931	1,182,512
Canada	8,707,021	13,013,283	10,065,865	14,391,897

[1] Dominion Bureau of Statistics.

ASBESTOS

By Oliver Bowles and B. H. Stoddard

INTRODUCTION

The production of unmanufactured asbestos in the United States in 1927 was more than double that of 1926, and indications point to continued activity in the industry. Two kinds of asbestos are mined in the United States—chrysotile, a form of serpentine, and anthophyllite, which belongs to the amphibole group. The output of raw material in the United States is much less than the demand, but the needed supply is readily obtained from Canada, whence it enters duty free.

The production of chrysotile asbestos in 1927 consisted almost entirely of Crudes Nos. 1 and 2, the highest grades of this type of asbestos. In general, the demand for raw chrysotile asbestos in 1927 was satisfactory, especially for crudes and spinning fibers. The market for paper stock and shorter fibers was fairly steady, although demand was not great; in fact, one or two mining companies curtailed production on account of threatened overproduction. However, increased demand later relieved this condition, and toward the end of the year no large stocks were on hand.

It is gratifying to note that the production of asbestos in the United States has steadily increased from 1922 to 1927, affording a promising outlook for the future. .

PRODUCTION

The total quantity of asbestos sold by producers in the United States in 1927 was 2,981 short tons, valued at $336,882. These figures represent chrysotile asbestos mined in Arizona and amphibole asbestos mined in Georgia and Maryland. The tonnage sold in 1927 was more than twice and the value nearly three times as great as in 1926. These figures represent increases in all the producing States.

Asbestos sold by producers in the United States, 1918–1927, by varieties

Year	Chrysotile		Amphibole		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1918	392	$101,059	606	$17,628	998	$118,687
1919	502	229,265	659	19,000	1,161	248,265
1920	1,245	661,907	403	16,324	1,648	678,231
1921	438	313.268	393	23,700	831	336,968
1922	25	3,320	42	6,800	67	10,120
1923	69	4,433	158	5,193	227	9,626
1924	173	33,941	127	8,585	300	42,526
1925	93	40,750	1,165	10,950	1,258	51,700
1926	(1)	(1)	(1)	(1)	1,358	134,731
1927	(1)	(1)	(1)	(1)	2,981	336,882

[1] Bureau of Mines not at liberty to publish figures.

In the United States deposits of chrysotile asbestos of possible commercial value have been found in Arizona, California, Montana, Vermont, and Wyoming, but in 1927 chrysotile asbestos was commercially produced in Arizona only. Deposits of mass-fiber anthophyllite (amphibole) have been worked in Georgia, Idaho, and North Carolina, but in 1927 commercial production was made in Georgia only. Slip-fiber anthophyllite (amphibole) has been mined in California and Maryland, but in 1927 Maryland was the only producer of this variety.

Following is a list of producers of asbestos in the United States making shipments in 1927:

Producers of asbestos in the United States making shipments in 1927

Name and address	Location of property
Arizona Asbestos Association (subsidiary of Johns-Manville Co.), Globe, Ariz.	Chrysotile, on Ash Creek, Gila County, Ariz.
L. M. Arnold, Statham, Ga.	1¼ miles northeast from Hollywood, Ga.
Estate of Abb Landis (Hollywood Asbestos Mines), Hollywood, Ga.	½ mile from Hollywood, Ga.
International Asbestos Co., Globe, Ariz.	45 miles north from Globe, Gila County, Ariz.
Powhatan Mining Corporation, Woodlawn, Baltimore, Md.	1 mile northwest from Pylesville, Md.
Regal Asbestos Mines (Inc.), 220 Broadway, New York, N. Y.	Gila County, Ariz.; nearest post office, Rice, Ariz.
San Carlos Asbestos Mining Co. (Inc.), Lakeside, Ariz.	Near top of Salt River Canyon, Gila County, Ariz.

REVIEW BY STATES

Arizona.—Arizona continued to be, as usual, the chief asbestos-producing State, and the quantity of chrysotile asbestos mined in this State in 1927 was the greatest ever recorded. The Arizona Asbestos Association (subsidiary of Johns-Manville Co.), at Chrysotile, reported that its product was manufactured into finished forms before being sold; the International Asbestos Co., W. G. Shanley, president, Globe, on its American Ores property, 45 miles north of Globe, Gila County, reported the completion of a new road; the Regal Asbestos Mines (Inc.) (E. Schaaf-Regelman), nearest post office, Rice, reported several hundred feet of new development work; and the San Carlos Asbestos Mining Co. (Inc.), Lakeside (operated by the J. O. Brown Operating Co., lessee), reported several feet of new tunneling and that new road and trail work was completed in 1927. The Riga Asbestos Mining Co., which in 1926 stated that it had opened up a very good grade of fiber and expected to install machinery for grading, reported in 1927 that the company was out of existence. Assessment work was carried on by others, but no production or sales were reported.

California.—No sales of asbestos were reported in 1927 from California, but assessment work was maintained by holders of claims. A report has been received to the effect that some development work in progress in Lake County, a few miles north of Middletown, has revealed a "fair showing" of asbestos. The property of the San Benito Asbestos Co. (California Asbestos Mining Co.), on Clear

Creek, 2½ miles from Hernandez, in San Benito County, was purchased at a bankruptcy sale by Norris K. Davis, of San Francisco.

Georgia.—During 1927 sales of amphibole asbestos in Georgia greatly exceeded those reported for 1926. L. M. Arnold, Statham, operated a mass-fiber anthophyllite property on Bear Creek, 1¼ miles northeast from Hollywood. The product is used chiefly for making chemical filters. The operations of the Hollywood Asbestos Mines, one-half mile from Hollywood, were continued actively, and sales of short-fiber amphibole, which it produces in several shades, far exceeded those of 1926. The material is used in the building trade for plaster, stucco, and flooring, in prepared cement for boiler and pipe coverings, and in the manufacture of composition battery boxes.

Maryland.—The Powhatan Mining Corporation worked, as in previous years, the Jenkins asbestos mine, in Harford County near Pylesville, which produces a high-grade slip-fiber anthophyllite used for making chemical filters. Development at this mine was extended to a depth of 50 feet. The product is hand cobbed, washed, and concentrated by special machines which remove all gangue (nonfibrous) matter and extraneous impurities. The remaining fibers, having been dried, go through an acid-washing process, which consists of digesting the fibers with pure hydrochloric acid until the iron and other impurities are completely dissolved. By a special filter apparatus and an abundance of wash water all traces of acid are said to be completely eliminated, as well as all "fines" or dustlike matter (very minute fibers). The material left consists of the thoroughly separated asbestos fibers, chemically pure and highly resistant to the action of acids. The treated fiber is dried, graded according to length, and packed.

Montana.—No sales of asbestos were reported from Montana in 1927. A new company called the Vermiculite & Asbestos Co., Harry C. Bolyard, president, reported the discovery early in 1927 of a deposit of asbestos on Raney Creek, 7 miles from Libby, Lincoln County. The asbestos vein, which is said to be 12 to 16 feet wide, has been developed by three tunnels—one of 70 feet which crosscuts the deposit, one 400 feet long, and one 150 feet long—besides several large open cuts. The company has shipped samples only.

North Carolina.—It is reported that plans have been made by the National Asbestos Co. at Minneapolis, Avery County, to develop amphibole asbestos deposits. A plant with a daily capacity of 30 tons is being erected, according to a statement by a member of the company.

PRICES

In 1927 the quoted market prices per ton on all the higher grades of Canadian chrysotile asbestos increased steadily, as shown in the following table compiled from prices quoted in the Engineering and Mining Journal. The prices of Canadian chrysotile asbestos (f. o. b. Quebec) largely govern domestic prices.

As may be observed from this table, Crude No. 1 increased from $525 to $650; Crude No. 2 from $300 to $400–$500; and spinning fibers from $190 to $200–$225. The advanced prices are due in no small measure to more centralized control of the industry.

Monthly prices per short ton of Canadian chrysotile asbestos, f. o. b. Quebec, in 1927

Grade	January	February	March	April	May	June
Crude No. 1	$525	$525	$525	$525	$525	$525
Crude No. 2	300	325	325	325	325	325
Spinning fibers	190	200	200	200	200	200
Magnesia and compressed sheet fibers	125-150	125-150	125-150	125-165	125-165	125-165
Shingle stock	80	80	80	70-80	70-80	70-80
Paper stock	40-45	40-45	40-45	40-45	40-45	40-45
Cement stock	25	25	25	25	25	25
Floats	15	15	15	15	15	15
Short fibers	10-17.50	10-17.50	10-17.50	10-17.50	10-17.50	10-17.50

Grade	July	August	September	October	November	December
Crude No. 1	$525	$525	$575	$575	$575	$650
Crude No. 2	325	325	375	375	375	400-500
Spinning fibers	200	200	225	225	225	200-225
Magnesia and compressed sheet fibers	125-165	125-165	150-200	160	160	160-175
Shingle stock	70-80	70-80	60-125	60-125	60-125	75-125
Paper stock	40-45	40-45	40-50	45-50	45-50	45-50
Cement stock	25	25	25	25	25	25
Floats	15	15	15	15	15	15
Short fibers	10-20	10-20	10-20	10-20	10-20	10-20

MINING AND MILLING

Mining methods vary according to the geological occurrence of the asbestos. The asbestos in limestone, such as the deposits in Arizona, is usually mined by tunnels and lateral drifts, or by some simple system of underground mining following the ore. In the Arizona field the ore is first blocked out and then stoped, the roof, after stoping, being upheld by the waste rock. In this field it is common practice to keep the roof close to the asbestos zone and to pick down the ore onto a large canvas after the supporting rock has been removed.

Asbestos in peridotite or large masses of serpentine is generally mined by open pit, as in Canada. After the rock is blasted it is sorted and cobbed, all fiber ¾-inch long and over being bagged as Crude No. 1, corresponding fiber ⅜ to ¾ inch in length being bagged as Crude No. 2. The mill fiber, or fiber shorter than ⅜ inch, is separated from the crushed rock by pneumatic and screening processes.

Crude fiber is usually graded by hand-cobbing and sorting, though sometimes the poorer material is screened. The very short fiber that forms the great bulk of the world's production is separated by milling. Mill fiber is graded largely on the basis of screen tests. Screens of 2, 4, and 10 meshes are used. Sixteen ounces of fiber is used, and the amount that is retained on each screen and passes through the last one is recorded after the screens have been shaken in a specified manner for about two minutes. Thus 1–8–5–2 would indicate that 1 ounce remained on the 2-mesh screen, 8 ounces on the 4-mesh, and 5 ounces on the 10-mesh, and that 2 ounces passed through the 10-mesh screen.

The volume of waste in the asbestos industry is enormous, for much of the rock broken must be discarded. For the Canadian field, the largest in the world, the total rock mined and quarried in 1927 was 4,822,756 short tons, of which 3,803,664 tons was milled; the average yield per ton of rock mined was 1 per cent of "crude" asbestos and a fraction over 6 per cent of mill fiber.

The waste product of milling is known as asbestic, or asbestos sand. It consists of serpentine, unaltered peridotite, and a small quantity of very short fiber and is used principally as an ingredient in plaster and stucco. Practically all the rock that goes through the mill is eventually asbestic. In other words, the production of asbestic is approximately the amount of rock milled minus the extraction of mill fiber. A market is found for only a very small percentage of this asbestic.

USES

Asbestos is one of the most important fireproofing materials known, and it is largely from the best chrysotile that heat and fire resistant textile products are made. Asbestos yarn is spun and woven into incombustible cloth, which is made into curtains and scenery for theaters and other amusement places. Asbestos cloth covered with rubber cement is made into gaskets—a use that consumes a considerable part of the production of crude asbestos. About 70,000,000 feet of brake lining is made of asbestos annually in the United States alone. The highest grades of crude asbestos are used for these purposes. Asbestos cloth is made into linings of various kinds, blankets, mattresses for insulation, and fireproof suits used by firemen and others. Asbestos is also made into aprons, gloves, mittens, leggings, and helmets, braided and woven tapes, woven sheet packing, wick and rope, clutch facings, and listings; is used for filtering purposes, and in laundries on mangles; and is employed in many other ways.

In respect to quantity consumed the chief use is probably in the manufacture of paper goods for building purposes, millboard, and asbestos shingles. Short-length fiber, the production of which far exceeds that of "crude" asbestos, is used for these purposes. Asbestos paper and millboard are used for heat and electric insulation in various ways. Asbestos sheeting paper is used between floors on account of its fire-resisting qualities; as a lining for stoves, heaters, filing cabinets, soldiers' helmets, mufflers of automobiles, drum controllers in sulphite mills, and automobile radiator covers; for filtration purposes; in the manufacture of tubes in the electrical industry, and of papers used for chemical purposes; and in many other ways. Millboard is used for making fireproof wall board, as a joint packing for steam pipes, etc., as a lining for safes, stoves, and heaters, electric switch boxes, garages, washers, hoods of automobiles, and ovens. The use of asbestos shingles, composed of asbestos fiber and Portland cement, is increasing, as is the demand for asbestos cement materials.

All the uses of asbestos can not be given here. Uses other than those mentioned are as an ingredient in fireproof paints, for making asbestos washers, for covering hose, and in the manufacture of gas burners and of boots and shoes.

IMPORTS AND EXPORTS[1]

Asbestos (unmanufactured) imported into and exported from the United States, 1918–1927

Year	Imports for consumption		Exports	
	Short tons	Value	Short tons	Value
1918	137,700	$6,337,608	697	$51,053
1919	135,270	7,369,685	1,119	157,416
1920	167,558	9,120,253	615	141,071
1921	72,463	2,948,302	520	101,600
1922	149,427	5,144,700	376	49,939
1923	212,420	7,445,143	680	48,525
1924	183,250	5,602,945	1,270	93,163
1925	230,520	7,134,302	1,109	70,846
1926	257,621	8,142,505	1,104	85,922
1927	223,693	8,150,340	309	48,774

Asbestos (unmanufactured) imported into the United States, 1926 and 1927, by countries

Country	1926		1927	
	Short tons	Value	Short tons	Value
Africa:				
British—				
East	10	$2,106		
South, Union of	2,405	317,816	3,479	$497,430
Portuguese—				
Mozambique	1,754	328,849	2,052	441,803
Other			75	15,390
Austria			26	777
Belgium			205	33,581
Canada	252,488	7,317,501	215,780	6,679,642
Colombia	36	472		
France	1	24		
Germany	349	65,424	1,782	430,479
India, British			3	88
Italy	1	372	6	1,209
Netherlands	28	1,050		
United Kingdom	549	108,891	285	49,941
	257,621	8,142,505	223,693	8,150,340

In the foregoing table the countries given are merely the countries from which asbestos was last shipped as shown by the invoices or manifests from which the records of imports were compiled. It is probable that British South Africa (Rhodesia and the Union of South Africa) was the actual source of practically all of the imports except those credited to Canada and Italy.

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[1] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

The exports of manufactured asbestos in 1926 and 1927 were as follows:

Manufactured asbestos products exported from the United States, 1926 and 1927, by grades

Grade	1926		1927	
	Quantity	Value	Quantity	Value
Brake and clutch lining____short tons__	760	$1,040,425	292	$379,437
Paper, millboard, and roll board____do____	896	153,046	788	116,616
Pipe covering and cement____do____	2,133	257,128	2,426	275,159
Textile yarn and packing____do____	725	813,993	704	780,841
Magnesia and manufactures____do____	3,290	323,386	2,766	308,539
Asbestos roofing____squares__	94,642	558,720	67,915	509,316
Other manufactures, except roofing____short tons__	1,361	335,116	1,283	317,178

WORLD PRODUCTION

World production of asbestos, 1923–1927, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country [1]	1923	1924	1925	1926	1927
Africa:					
Rhodesia, Southern	18,474	23,715	31,161	30,249	30,097
Union of South Africa	7,614	6,569	9,224	12,789	20,085
Argentina [2]	4	----	----	38	1
Australia:					
New South Wales	207	----	----	5	----
South Australia	7	4	----	----	----
Western Australia	117	75	51	107	11
Canada	[3] 164,014	[3] 150,768	[4] 248,136	[4] 253,469	[4] 249,273
China [5]	[6] 128	127	216	(7)	(7)
Cyprus [5]	2,186	4,442	3,255	6,627	11,079
Finland	(7)	(7)	1,347	1,674	1,298
France	664	882	2,201	(7)	(7)
India, British	251	127	16	59	69
Italy	1,538	2,160	2,105	2,500	(7)
Japan	826	621	1,174	(7)	(7)
Russia [8]	4,780	8,456	12,330	18,334	21,057
United States	206	272	1,141	1,232	2,704

[1] In addition to the countries listed, Bolivia, Brazil, and Madagascar are reported to produce small quantities of asbestos. Statistics of production are not available, but the exports reported are considerably less than a ton.

[2] Railroad shipments.

[3] Exclusive of by-products (fillers and other short fibers, sand, and gravel), the production of which is reported as follows: 1923, 45,982 tons; 1924, 54,023 tons.

[4] Exclusive of sand and gravel, the production of which is reported as follows: 1925, 15,300 tons; 1926, 14,217 tons; 1927, 18,398 tons.

[5] Exports.

[6] A production of 7,068 metric tons is reported for China in 1923. (Imp. Min. Res. Bur., London.)

[7] Data not available.

[8] Year ended Sept. 30.

FOREIGN SOURCES OF ASBESTOS

CANADA

The production of chrysotile asbestos in Quebec provides practically all of the short-fiber asbestos and a considerable portion of the supply of spinning fibers for the asbestos-manufacturing industry of the United States. On a tonnage basis, Canada produces about 80 per cent of the world supply of asbestos, and most of this is exported to the United States.

In 1927 the quantity of asbestos sold or shipped in Canada totaled 274,778 short tons, or slightly less than in 1926, but the value reached a new high level, $10,621,013, compared with $10,099,423 in 1926, a gain of 5.2 per cent. This was due in part to the higher price levels on practically all grades throughout 1927 and in part to the fact that material mined yielded a greater proportion of high-grade product than in the preceding year. The average price of all asbestos shipped, as given by the Bureau of Mines of the Province of Quebec, was $38.65 per ton in 1927 as compared with $36.15 in 1926.

Two new cableways have been installed at the King mine of the Asbestos Corporation. They have a span of 1,400 feet, as against 937 feet for the old ones, and they are capable of lifting a net load of 10 tons, whereas the six cableways formerly used each had a net lifting capacity of 6 tons. The Asbestos Corporation is also joining the Beaver pit and the Consolidated Mining Co.'s pit and is erecting a new mill large enough to handle the output from these two properties. This development will cost between $1,500,000 and $2,000,000 and will require two or three years.

From the Bell Asbestos mine, a very large pit adjacent to the King, the rock is taken to the surface through a haulage tunnel 1,100 feet long, a variation from the almost universal use of overhead cableway.

The consolidation of important asbestos interests in one firm, the Asbestos Corporation (Ltd.), has resulted in certain price regulations to stabilize the industry, a procedure which is perfectly legal in Canada, but its application in the American market has led to a suit charging violation of the antitrust laws. The suit is still pending.

Tests on the use of asbestos-mill waste as a fertilizer have so far failed to show any definitely beneficial results.

An interesting recent development is the formation of the Asbestos By-Products Corporation (Ltd.) for the manufacture of bricks and hollow tile from asbestos tailings or refuse. The plants planned for completion in the immediate future will have a capacity of 1½ million tile and 14½ million brick.

SOUTH AFRICA

Rhodesia.—Southern Rhodesia is the second largest asbestos-producing district in the world, being exceeded only by the southern Quebec area in Canada. The product is a chrysotile of high quality, comparing favorably with the Canadian fiber. The asbestos is shipped generally by way of Beira in Portuguese East Africa.

In a period of 15 years the industry has grown from a very small beginning until now it is second in importance only to gold. The most important area is the Shabani, comprising two groups of mines belonging respectively to The Rhodesian and General Asbestos Corporation (Ltd.) and the African Asbestos Mining Co. (Ltd.). A milestone in the progress of the industry was reached with the completion and formal opening in May, 1928, of the Shabani Railway, which links up the mines with the main line at Somabula, 63 miles distant. The former 56-mile haul by ox wagons was a severe handicap to growth of the industry. Increasing activity and a substantial advance in the price of asbestos stocks on the London market have created the impression of a boom in asbestos, both in Rhodesia and in the Union. As all present Rhodesian asbestos mines are in the southern part of the State, it is of interest to note a reported discovery of good fiber near Lusaka in northern Rhodesia.

Production in Rhodesia in 1927 fell a little below that of 1926, just as the 1926 production was a little short of the figure for 1925. The production value, however, was the second highest ever reached, being exceeded only by a very small margin in 1921 in a period of phenomenally high prices. The production in 1927 is given at 33,176 short tons, valued at £794,215. Conditions in Rhodesia show almost the same trend as in Canada—a slight falling off in volume of production but an increase in value, reflecting the higher price per ton. The average price per short ton of Rhodesian fiber in 1927 on the basis of average annual exchange was $116.37, while the Canadian average was $38.65 per short ton. The great difference in price is due to the fact that the shorter low-priced fibers, although sold in great quantities in America, can not be shipped profitably from Rhodesia, as the African trade is confined to asbestos commanding a sufficiently high price to justify the long haul.

The chief producer, The Rhodesian and General Asbestos Corporation (Ltd.), reports steadily improving conditions. Increased plant capacity, especially at the Shabani mine, was expected to increase greatly the output, beginning about March, 1928.

Rhodesian production over a period of years is shown in the following table:

Asbestos produced in Rhodesia, 1914–1927

Year	Short tons	Value	Year	Short tons	Value
1914	487	£8,612	1921	19,529	£795,698
1915	2,010	32,190	1922	14,249	577,699
1916	6,157	99,059	1923	20.364	626,880
1917	9,562	189,890	1924	26,141	603,423
1918	8,574	158,684	1925	34,349	765,926
1919	9,799	425,240	1926	33,344	726,835
1920	18,823	459,572	1927	33,176	794,215

Union of South Africa.—The Union possesses an unusual diversity of asbestos, including all three of the important varieties—chrysotile, crocidolite (blue asbestos), and amosite—and, in addition, occasional amounts of tremolite. In 1927 there was a notable increase in production, both tonnage and value being over 50 per cent above the 1926 figures. Three factors have contributed to this increase. In the first place, the long-fibered amosite of the Transvaal, which 10 years ago was merely a curiosity, has developed so strong a market that its production was almost doubled during 1927. In the second place, the increased demand for blue asbestos was well sustained in 1927 as in 1926. The Cape Asbestos Co. has been the chief producer of blue fiber, but recently Turner Bros. have acquired important interests. The tendency of these two organizations is to develop the mines on a somewhat larger scale than heretofore. The third factor is the high percentage of long fiber in the deposits at Barberton in the Transvaal. Some of the benches in the Amianthus mine run 30 per cent fiber averaging about one-half inch in length. There was an increase in chrysotile production in this field of nearly 5,000 tons during 1927. The chief producers are Turner & Newall (Ltd.)

(formerly Turner Bros.), operating the New Amianthus mine, and Munnik-Myburgh Asbestos (Ltd.). The district is handicapped by very difficult transportation over a 2,000-foot escarpment. Ox and mule wagons are now employed, but an aerial tramway is planned. The present mountainous road from the Amianthus mines to Godwan River Station is about 18 miles in length, and the present cost of transportation is estimated at 27s. 6d. per ton. The direct route is about 7 miles, and on the basis of costs in Cyprus the aerial ropeway haulage cost would be only about 3s. 8d. per ton.

The following table gives the production over a period of eight years:

Asbestos produced in the Union of South Africa, 1920–1927, in short tons

Year	Transvaal	Cape Province	Natal	Total	
				Short tons	Value
1920	3,541	3,526	45	7,112	£114,195
1921	1,593	3,467	62	5,122	103,067
1922	1,392	2,991	6	4,389	81,230
1923	4,076	4,317	----------	8,393	121,453
1924	4,240	3,001	----------	7,241	110,075
1925	7,628	2,540	----------	10,168	152,115
1926	10,104	3,993	----------	14,097	216,466
1927	17,313	4,827	----------	22,140	343,301

The relative importance of the different varities of asbestos is shown as follows:

Asbestos produced in the Union of South Africa in 1927, by varieties

	Short tons	Value
Amosite (Transvaal)	5,093	£50,319
Chrysotile (Transvaal)	12,174	184,897
Blue (Transvaal)	46	1,639
Blue (Cape)	4,827	106,446
	22,140	343,301

Exports of African asbestos are shown in the following table:

Asbestos exported from Africa, 1926 and 1927, in short tons

	1926	1927
From Rhodesia (crude)	32,931	29,813
From Union of South Africa	8,416	12,705
From all South Africa to the United States	4,873	5,587

RUSSIA

For several years prior to the World War Russia was the second largest asbestos producer, providing 11 to 15 per cent of the world supply. The war, followed by the revolution and establishment of the Soviet State, brought production almost to a standstill, from which there is a slow but gradually accelerating recovery.

The most important asbestos district of Russia is Bazhenovo, 35 kilometers from the Bazhenovo-Omsk Railway and 90 kilometers northeast of Sverdlovsk (Ekaterinburg). The length of the asbestos belt is about 18 kilometers and the width from 200 to 1,200 meters. There are in all about 20 open quarries in the district, six of which are worked regularly. Recent estimates indicate a reserve of about 8½ million tons of commercial fiber of the chrysotile type, occurring in serpentine. This district has produced over 95 per cent of the Russian supply. The whole district is provided with electric power to operate drills, pumps, trolleys, and mill machinery. There are five asbestos mills in the district. A sorting plant has an annual capacity of 30,000 tons.

There is a large asbestos deposit in the Alapaevsk district near the Niza River. The Allied American Corporation, a branch of the Allied Drug & Chemical Co., received a license to operate here in 1918. About 350 tons of asbestos were produced in 1922, but little has been done since. Other districts are Neviansk, Ostanino, Kholmistis, and Aktashevsk. There are also many occurrences in Siberia and in the Caucasus.

In 1918 the asbestos mines became State property by Soviet decree. Owing to disorganization, as well as to lack of fuel and food, resumption of activity was slow. To stimulate production "The State Union of the Asbestos Mines" was established in 1921. Progress has been slow owing to lack of capital, but production is gradually increasing.

Most of the Russian asbestos of the higher grades is exported. Almost all of it is carried to Hamburg for distribution, chiefly to central European countries. Grade 1 (fiber length ¾ to 1½ inches) was selling in 1925 at £50 to £60 per metric ton. The production in 1927 was 23,211 short tons, an increase over 1926 of 15 per cent. Evidently Russia is again becoming an important factor in the market.

AUSTRALIA

A small fiber-treatment plant has been erected at Lionel near Nullagine in Western Australia. Production for Western Australia in 1926 is given officially as 105 long tons, valued at £2,728. Figures from another source give 133 tons, valued at £2,706. Production in 1927 is reported as 11 long tons, valued at £304.

AUSTRIA

A fiber deposit designated as microasbestos has been found in Austria. It closely resembles the gray amphibole mined at Hollywood, Ga.

CHINA

Asbestos deposits occur in a number of Provinces in China, including Chihli, Jehol, Chahar, Suiyuan, Shensi, Szechuan, Hupeh, and Kwangtung. Four asbestos-manufacturing companies operate in Tientsin, the largest being the Tientsin Asbestos Co., which employs 30 men. The chief asbestos supply for these plants is obtained from the Laiyuan mines in Chihli Province. The deposits are said to cover 100 square miles and are worked by four companies. Chinese asbestos products are mostly for domestic consumption, though some are shipped to Japan.

CYPRUS

For two years in succession asbestos production in Cyprus has nearly doubled. With large well-equipped mills and a satisfactory transportation system, the industry now seems to be established on a sound and profitable basis. The aerial ropeway over 18 miles long, connecting the mines at Amiandos with the seaport at Limassol, is giving very satisfactory service. The construction cost was about £2,320 per mile. The cost of transporting asbestos the entire distance, including interest on investment and complete amortization of the plant in 10 years, is given as 6s. 9d. per ton, whereas the motor wagon or animal transport formerly employed on the 37-mile winding road cost 20s. to 25s. per ton.

Export figures for recent years are given in the following table:

Asbestos exported from Cyprus, 1922–1927

Year	Long tons	Value	Year	Long tons	Value
1922	2,285	£22,899	1925	3,204	£54,159
1923	2,151	57,115	1926	6,522	124,707
1924	4,372	80,070	1927	10,904	207,562

FINLAND

Finland produces a small tonnage of asbestos which is evidently of the nonspinning variety. A mill at Helsingfors manufactures asbestos board, Eternit tiles, packing, clothing, and gloves. Some fiber is imported.

ITALY

A large deposit of asbestos is reported to have been discovered near Balangero. The editor of Asbestos obtained samples which were found to consist of a very white amphibole fiber.

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PHOSPHATE ROCK

By B. L. Johnson[1]

PHOSPHATE ROCK SOLD

The quantity of phosphate rock sold or used by producers in the United States in 1927 amounted to 3,170,699 long tons, a decrease of 39,277 tons, or 1 per cent, from 1926. The total value of the rock sold in 1927 was $11,253,352, an increase of $359,552, or 3 per cent, as compared with 1926. The average selling value a ton for 1927 was $3.55, whereas that for 1926 was $3.39, an increase of 16 cents. The quantity of phosphate rock sold or used by producers in 1927 exceeded the quantity mined by 145,550 tons, or 5 per cent. The excess came from stocks held over from the preceding year.

The unit of quantity used in this report in referring to phosphate rock is the long ton (2,240 pounds), except as otherwise specified. The value of the domestic material means selling value f. o. b. mines, so far as it can be determined from the returns submitted by the respective companies.

Phosphate rock sold or used by producers in the United States, 1918–1927

Year	Long tons	Value	Year	Long tons	Value
1918	2,490,760	$8,214,463	1923	3,006,706	$11,576,049
1919	2,271,983	11,591,268	1924	2,867,789	10,252,083
1920	4,103,982	25,079,572	1925	3,481,819	11,545,678
1921	2,064,025	12,270,070	1926	3,209,976	10,893,800
1922	2,417,883	10,482,846	1927	3,170,699	11,253,352

Statistics covering the sales of raw phosphate rock by producers for direct application to the soil are available since 1914. Sales for this purpose reached a maximum of 79,189 long tons in 1919, declined sharply in the 1921 business depression to 13,503 tons, remained at the low level of from 10,000 to 16,000 tons from 1922 to 1924, and in 1925 stepped up to the present level, about 30,000 tons. The sales in 1926 were slightly below those in 1925. In 1927 sales amounted to 32,957 tons—only 42 per cent of the sales peak of 1919 but higher than in any other year since 1920, were 10 per cent above those in 1926, and 3 per cent above those in 1925. Tennessee and Wyoming are reported to have supplied all the ground rock sold in 1927 for direct application. By far the greater part of these sales was from Tennessee. The producers reporting sales of raw phosphate rock in 1927 for direct application to the soil were:

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[1] The statistics in this report on the domestic industry were prepared by B. H. Stoddard, and the data on imports and exports were compiled from the records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, both of the Bureau of Mines.

Charleston, S. C., Mining & Manufacturing Co., 11 South Twelfth Street, Richmond, Va. Plants at Gordonsburg and Mountpleasant, Tenn.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Plant at Wales, Tenn.

Ruhm Phosphate & Chemical Co., Mountpleasant, Tenn.

Tennessee-Illinois Phosphate Co., 137 South La Salle Street, Chicago, Ill. Plant at Twomey, Tenn.

Cokeville Phosphate Co., Cokeville, Wyo.

There are fine-grinding mills also at the plants of the Anaconda Copper Mining Co., Conda, Idaho; the Amalgamated Phosphate Co., Brewster, Fla.; the Phosphate Mining Co., Nichols, Fla.; and the Lakeland Phosphate & Chemical Co., Bartow, Fla. The last three are in the land pebble district of Florida. None of these companies reported marketing ground rock in 1927 for direct application to the soil. Various types of phosphate rock were ground in 1927 for direct application to the soil. Tennessee sales were of ground blue phosphate rock and of ground brown phosphate rock. Some of the Tennessee companies grind a washed brown phosphate rock, but one company has a deposit of brown phosphate rock that is rich enough to use without washing. It is dried and some of the nonphosphatic material removed by air separation before grinding. The Wyoming rock used for this purpose is the unweathered rock phosphate.

Raw phosphate rock sold by producers in the United States for direct application to the soil, 1918–1927, in long tons

1918	45,294	1923	10,548
1919	79,189	1924	14,320
1920	72,801	1925	31,999
1921	13,503	1926	29,902
1922	16,029	1927	32,957

The quantity of phosphate rock reported sold in 1927 for the manufacture of phosphorus and chemicals containing phosphorus (other than the superphosphates) was 220,000 long tons. This is the largest use for phosphate rock other than for the making of the superphosphates. The actual quantity sold for this purpose, however, is probably even greater than that indicated above, some of the producing companies failing to report on sales for this purpose. The companies reporting the production and sales of phosphate rock in 1927 for the manufacture of phosphorus and chemicals containing phosphorus (other than the superphosphates) were:

Amalgamated Phosphate Co., 535 Fifth Avenue, New York, N. Y. Mine at Brewster, Fla.

Coronet Phosphate Co., 99 John Street, New York, N. Y. Mine at Plant City, Fla.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Mine at Mulberry, Fla.

Anaconda Copper Mining Co. (fertilizer department), Conda, Idaho.

Charleston, S. C., Mining & Manufacturing Co., 11 South Twelfth Street, Richmond, Va. Mines at Gordonsburg and Mountpleasant, Tenn.

R. L. England, Mountpleasant, Tenn.

Federal Chemical Co., 1100 Lincoln Building, Louisville, Ky. Mines at Century and Ridley, Tenn.

Ligon & Huff, Mountpleasant, Tenn.

The phosphate rock sold to blast furnaces in 1927, as reported by the producers, amounted to 25,385 long tons, an increase of 9 per cent over 1926. All of the phosphate rock sold to blast furnaces in 1927 is reported to have come from Tennessee and Wyoming. No sales of Florida rock for this purpose were reported by the producing companies. Companies reporting sales of phosphate rock in 1927 for blast-furnace use were:

Charleston, S. C., Mining & Manufacturing Co., 11 South Twelfth Street, Richmond, Va. Mines at Gordonsburg and Mountpleasant, Tenn.
Federal Chemical Co., 1100 Lincoln Building, Louisville, Ky. Mines at Century and Ridley, Tenn.
Hoover & Mason Phosphate Co., 1407 Railway Exchange, Chicago, Ill. Mine at Mountpleasant, Tenn.
International Agricultural Corporation, 61 Broadway, New York, N. Y. Mine at Mountpleasant, Tenn.
Petrified Bone Mining Co., Mountpleasant, Tenn.
Cokeville Phosphate Co., Cokeville, Wyo.

The quantity of phosphate rock sold as an ingredient for stock feed was 4,297 long tons, a slight decrease from 1926. Most of the rock sold for this purpose was Tennessee brown rock. Companies reporting the production and sale of phosphate rock in 1927 for this use were the following:

International Agricultural Corporation, 61 Broadway, New York, N. Y. Mine at Mulberry, Fla.
Charleston, S. C., Mining & Manufacturing Co., 11 South Twelfth Street, Richmond, Va. Mines at Gordonsburg and Mountpleasant, Tenn.
Ruhm Phosphate & Chemical Co., Mountpleasant, Tenn.
Tennessee-Illinois Phosphate Co., 137 South La Salle Street, Chicago, Ill. Mine at Twomey, Tenn.

One company only, the Harsh Phosphate Co., Nashville, Tenn., sold phosphate rock (Tennessee brown phosphate rock) for use as a fertilizer filler.

PHOSPHATE ROCK MINED

The quantity of phosphate rock mined in 1927 was 3,025,149 long tons, a decrease of 566,873 tons, or 16 per cent, from 1926. The greater part (520,733 tons, or 92 per cent) of this decrease is the result of lessened production in Florida. There was a decrease of 10 per cent in the Tennessee-Kentucky fields. Most of this decline was in the Tennessee field; no phosphate rock was mined in Kentucky in 1927. The Western States showed an increase of 7 per cent over 1926 in quantity of phosphate rock mined.

Phosphate rock mined in the United States, 1918–1927, by States, in long tons

Year	Florida	South Carolina	Tennessee and Kentucky	Western States	Total
1918	1, 884, 891	33, 673	353, 726	11, 955	2, 284, 245
1919	1, 254, 609	49, 032	530, 973	16, 935	1, 851, 549
1920	3, 255, 720	42, 709	627. 677	48, 895	3, 975, 001
1921	2, 088, 251	------------	332, 962	4, 961	2, 426, 174
1922	2, 018, 809	------------	300, 566	17, 481	2, 336, 856
1923	2, 421, 571	------------	487, 420	34, 575	2, 943, 566
1924	2, 373, 530	------------	431, 038	40, 735	2, 845, 303
1925	2, 672, 650	2, 147	495, 072	83, 802	3, 253, 671
1926	3, 064, 441	------------	481, 839	45, 742	3, 592, 022
1927	2, 543, 708	------------	[1] 432, 610	48, 831	3, 025, 149

[1] Figures represent Tennessee only; no production reported from Kentucky in 1927.

STOCKS

Stocks of phosphate rock in the hands of the producers on December 31, 1926, are estimated to have amounted to about 880,000 long tons. Deductions were made from these stocks during 1927 because of the excess of phosphate rock sold over that mined in that year, as already noted, and on December 31, 1927, these stocks are estimated to have been reduced to about 735,000 tons.

REVIEW BY STATES

In 1927, with the exception of Florida, there was an increase in the quantity of phosphate rock sold in each of the States and also an increase in total value except in Wyoming, where the value of sales was reported as the same as in 1926. There was a general increase in average value of the phosphate rock sold, ranging from 7 cents per ton in Florida to $1.29 per ton in the Western States. The increase in Tennessee was 46 cents.

Phosphate rock sold or used by producers in the United States, 1926–1927, by States

State	1926		1927	
	Long tons	Value	Long tons	Value
Florida:				
Hard rock	116, 264	$465, 308	131, 254	$525, 016
Land pebble	2, 591, 943	8, 218, 200	2, 506, 166	8, 121, 146
	2, 708, 207	8, 683, 508	2, 637, 420	8, 646, 162
Tennessee and Kentucky: Brown and blue rock	464, 192	2, 048, 272	[1] 481, 769	[1] 2, 318, 785
Western States:				
Idaho	33, 113	133, 020	45, 260	259, 405
Wyoming	4, 464	29, 000	6, 250	29, 000
	3, 209, 976	10, 893, 800	3, 170, 699	11, 253, 352

[1] Figures represent Tennessee only; no sales reported from Kentucky in 1927.

FLORIDA

In 1927 Florida continued to hold first place in the United States as a producer of phosphate rock, a position which it has held continuously since 1894, when it took the lead from South Carolina. It was the source of 83 per cent of the total phosphate rock sold or used by producers in the United States in 1927. Production of phosphate rock in Florida has declined during the past two years. The decrease in 1927 was 2.6 per cent in quantity and 0.4 per cent in value from the previous year's figures. The average value, on the other hand, has increased following the sharp decline from $5.86 a ton in 1921 to $3 a ton in 1925, and it increased from $3.21 in 1926 to $3.28 in 1927.

Land-pebble phosphate rock constituted 95 per cent of Florida phosphate rock production in 1927 and hard-rock phosphate the remaining 5 per cent. There were two producers of hard-rock phosphate and 8 producers of land pebble.

The domestic consumption (sales less exports) of Florida phosphate rock has declined during the past two years. The decrease in 1926 from 1925 was 100,520 long tons; that in 1927 from 1926 was even greater, the domestic consumption in 1927 being nearly a quarter of a million tons (240,035 tons) less than that in 1926.

Exports of both hard rock and land pebble were greater in 1927 than in 1926.

The general trend of hard-rock phosphate production has been downward since 1907. In 1927 there was a slight reaction from the decline of 1926, and the hard-rock production increased 13 per cent in quantity due to the greatly increased demand from Germany for the hard rock; the total value also increased 13 per cent. The average value of the hard rock f. o. b. mines was $4 a ton in both 1927 and 1926. The deposits worked were near Dunnellon and Hernando. The overburden is stripped by hydraulic methods and the hard rock mined by dipper dredges with 1½-cubic yard buckets, floating in artificial ponds. The matrix mined is hauled in 1-bucket-capacity cars to the washers on the edge of the pits, where the phosphate rock is washed and concentrated. The greater part of the hard rock was shipped to Fernandina, on the east coast of Florida, dried there, and shipped from that port. A little hard rock was sold on the domestic market. The companies operating in 1927 were:

Mutual Mining Co., Savannah, Ga. Mine at Dunnellon.
J. Buttgenbach Co., Dunnellon. Mines at Dunnellon and Hernando.

Land-pebble phosphate rock constituted 95 per cent of the Florida output in 1927 and showed a decrease of 3 per cent in quantity and 1 per cent in value as compared with 1926. The average value f. o. b. mines was $3.24 a ton in 1927 as compared with $3.17 a ton in 1926. The marketed production in 1927 was 91 per cent of the recent high production of 1925 and 85 per cent of the highest land-pebble production yet recorded, that of 1920. Land-pebble exports in 1927 were the greatest since the opening of the World War. About 30 per cent of the production was exported in 1927 as against 24 per cent in 1926. Of the domestic shipments a little over one-half is reported to have been shipped by water and the rest by rail.

The Florida land-pebble area remains by far the largest individual phosphate rock-producing district in the United States. In the last two years (1926 and 1927), however, the production has shown declines due to the somewhat smaller quantity of land pebble sold in those two years in the domestic market.

The land-pebble phosphate rock came from Polk and Hillsborough Counties. The deposits are flat-lying unconsolidated sediments of Pliocene or later age, reconcentrations from the marine planated phosphate-bearing Miocene limestone bed rock. The phosphate-bearing material, known locally as "matrix," variable in quantity and thickness, is overlain by variable thicknesses of sand or clay. The overburden is stripped either by drag-line excavators or by hydraulic methods. One company was using a steam shovel at one of its pits. Mining of the matrix is entirely by hydraulicking. The material washed down is pumped to washing plants located near the pits. The concentrated wet phosphate rock from these washers is transported to the drying plants where, after partial drying by drainage in wet storage piles, it is dried in oil-fired direct heat rotary driers.

In 1927 eight companies were producing land-pebble phosphate rock, as follows:

Amalgamated Phosphate Co., 535 Fifth Avenue, New York, N. Y. Mines at Brewster and Green Bay.

American Agricultural Chemical Co., 420 Lexington Avenue, New York, N. Y. Mine at Pierce.

Coronet Phosphate Co., 99 John Street, New York, N. Y. Mines at Pembroke and Plant City.

Florida Phosphate Mining Corporation, Norfolk, Va. Mine near Bartow.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Mines at Mulberry.

The Phosphate Mining Co., 110 William Street, New York, N. Y. Mines at Bartow and Nichols.

Southern Phosphate Corporation, 44 Wall Street, New York, N. Y. Mine at Eaton Park.

Swift & Co., Chicago, Ill. Mine near Bartow.

An investigation of flotation for low-grade phosphate ores and rejected materials from the Florida washers in the land-pebble district is being carried on at the Southern Experiment Station of the United States Bureau of Mines. A preliminary statement of results has been issued.[2]

Florida phosphate rock sold or used by producers, 1918–1927

Year	Hard rock			Soft rock		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1918	62,052	$377,075	$6.08	8,331	$147,103	$17.66
1919	285,467	2,452,563	8.59	14,498	196,318	13.54
1920	400,249	4,525,191	11.31	13,953	190,551	13.66
1921	175,774	1,806,671	10.28	4,419	20,153	4.56
1922	188,084	1,308,201	6.96	446	3,500	7.85
1923	199,516	1,071,675	5.37	----------	----------	----------
1924	143,115	629,579	4.40	----------	----------	----------
1925	171,649	707,933	4.12	----------	----------	----------
1926	116,264	465,308	4.00	----------	----------	----------
1927	131,254	525,016	4.00	----------	----------	----------

Year	Land pebble			Total		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1918	1,996,847	$5,565,928	$2.79	2,067,230	$6,090,106	$2.95
1919	1,360,235	5,149,048	3.79	1,660,200	7,797,929	4.70
1920	2,955,182	14,748,620	4.99	3,369,384	19,464,362	5.78
1921	1,599,835	8,604,818	5.38	1,780,028	10,431,642	5.86
1922	1,870,063	7,035,821	3.76	2,058,593	8,347,522	4.05
1923	2,348,137	7,987,752	3.40	2,547,653	9,059,427	3.56
1924	2,289,466	7,387,897	3.23	2,432,581	8,017,476	3.30
1925	2,758,315	8,081,137	2.93	2,929,964	8,789,070	3.00
1926	2,591,943	8,218,200	3.17	2,708,207	8,683,508	3.21
1927	2,506,166	8,121,146	3.24	2,637,420	8,646,162	3.28

Quotations for Florida land-pebble phosphate rock at the end of the year are given in the following table. The rapid rise in the prices of phosphate rock from the lower to the higher grades is related not only to the increased total content of tricalcium phosphate (known to the industry as "B. P. L.," or "bone phosphate of lime"), but reflects also an increased worth per unit of tricalcium phosphate in the higher grades.

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[2] Lawrence, H. M., and De Vaney, F. D., Flotation of Low-Grade Phosphate Ores: Repts. of Investigations, Serial 2860, Bureau of Mines, March, 1928.

Prices of pebble phosphate per long ton, f. o. b. Florida[3]

Export prices:		Domestic prices:	
76 to 77 per cent	$7.00	76 to 77 per cent	$6.00
75 per cent	6.25	74 to 75 per cent	5.00
74 to 75 per cent	6.00	72 per cent	4.00
70 per cent	4.50	70 per cent	3.50
68 per cent	4.10		
66 per cent	4.00		

TENNESSEE AND KENTUCKY

Tennessee is the second largest phosphate rock-producing State, ranking next to Florida, and has maintained this position since it passed South Carolina in 1899. The Tennessee phosphate deposits at present worked are in west-central Tennessee. Two types of rock are now mined—"brown phosphate rock" and "blue phosphate rock." The brown phosphate rock is the residual weathered and leached outcrop of the phosphatic Ordovician limestones, exposed over a wide area in the southern part of the central basin of Tennessee, where the erosion of that basin in the summit of the Nashville dome has exposed the underlying Ordovician phosphatic limestones. The so-called blue phosphate rock is a thin, unweathered highly phosphatic stratum of Devonian or Carboniferous (Mississippian) age occurring in the western part of the phosphate region.

The overburden of the brown rock phosphate is clay and is removed by large companies using drag-line excavators. Mining of the brown rock is by drag-line excavators whenever possible. Where the phosphate is thin or lies in narrow channels ("cutters") in the limestone and can not be mined by the drag-line excavators it is mined by pick and shovel. The use of steam shovels and hydraulic methods for stripping or mining is no longer practiced. An electric shovel is used in mining phosphatic filler near Nashville. The blue rock is mined by underground methods—drift mining by single-entry room-and-pillar system.

Most of the brown rock is washed. Lump phosphate rock suitable for furnace use is either removed in the course of hand-mining operations or is taken out by screens in the early stages of washing. The washing process consists mainly in first thoroughly agitating the phosphate-bearing material with water to disintegrate it, so that all the clay and fine sand are in suspension and separated from the coarse sand and lumps. Next follows removal of the coarser phosphatic material by screening and the separation of the finer phosphatic grains from clay in mechanical or hydraulic classifiers. The wet rock from the washers is allowed to drain of excess moisture in outdoor storage piles and is then dried further in coal-fired direct heat rotary driers. The blue phosphate rock requires only crushing and drying before shipment.

The quantity of Tennessee phosphate rock sold or used by producers in 1927 amounted to 481,769 long tons, with a value of $2,318,785. There was an increase in average value from $4.35 in 1926 to $4.81 in 1927. After the opening of the Tennessee fields in 1894 production climbed rapidly to 1907, when it reached the maximum of 638,612 tons. The growth of the industry was curtailed by the 1909 depression. Slow recovery followed to a second peak of 621,396 tons in 1920, with a value of $4,857,399, or nearly $2,000,000 more than the value of the

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[3] Engineering and Mining Journal, vol. 125, No. 1, Jan. 7, 1928, p. 38

1907 peak production. The 1921 depression hit the Tennessee phosphate rock industry for a greater loss in production than the 1909 depression, and production fell in that year (1921) to 264,159 tons, the lowest production since 1897. Recovery from the 1921 depression brought the production to 464,240 tons in 1925, 75 per cent of the 1920 peak. The 1926 production showed a decrease of 2 per cent from the 1925 figures, while 1927 increased 6 per cent over 1926 and 4 per cent over 1925.

About 90 per cent of the phosphate rock production of Tennessee comes from the brown rock fields. As there were only two producers of blue rock in 1927—the Charleston, S. C., Mining & Manufacturing Co., operating the Mayfield mine at Gordonsburg, and R. L. England, operating the Glover mine at the same place—the figures for blue rock have been included with those for brown rock. The amount of Tennessee raw phosphate rock sold for direct application to the soil was about 10 per cent greater in 1927 than in 1926.

There were 15 phosphate rock-mining companies operating in Tennessee in 1927, employing a total of about 1,000 people. These companies are:

American Agricultural Chemical Co., 420 Lexington Avenue, New York, N. Y. Mine at Spring Hill.
Armour Fertilizer Works, 111 West Jackson Boulevard, Chicago, Ill. Mines near Columbia.
Charleston, S. C., Mining & Manufacturing Co., 11 South Twelfth Street, Richmond, Va. Mines at Gordonsburg and Mountpleasant.
J. K. Davis, Mountpleasant.
R. L. England, Mountpleasant. Mine at Gordonsburg.
Federal Chemical Co., 1100 Lincoln Building, Louisville, Ky. Mines at Century and Ridley.
M. H. Gray, Mountpleasant.
Harsh Phosphate Co., Nashville.
Hoover & Mason Phosphate Co., 1407 Railway Exchange, Chicago, Ill. Mine at Mountpleasant.
International Agricultural Corporation, 61 Broadway, New York, N .Y. Mines at Mountpleasant and Wales.
Ligon & Huff, Mountpleasant.
New England Phosphate Corporation, Centerville.
Petrified Bone Mining Co., Mountpleasant.
Tennessee-Illinois Phosphate Co., 137 South La Salle Street, Chicago, Ill. Mine at Twomey.
R. H. Workman, Mountpleasant.

There were few new developments in the phosphate rock industry in Tennessee in 1927. Two new fine-grinding plants were erected, one replacing a plant destroyed by fire in 1926. One company located a plant for the production of phosphoric acid by the sulphuric acid method directly at the mine, the phosphoric acid to be used at the same place for the manufacture of triple superphosphate and trisodium phosphate.

The Kentucky deposits of brown rock are the weathered outcrops of phosphatic limestones, as are the Tennessee occurrences, and are exposed in the Blue Grass region of central Kentucky by the erosion of the Jessamine dome. These deposits were not worked in 1927. Only one company, the United Phosphate & Chemical Co., has been operating in the Kentucky phosphate fields in recent years. The property of this company is reported to have been worked out and the stocks cleaned up in 1926; its plant at the Wallace mine near Midway, Ky., is said to have been dismantled and the land sold in 1927.

Tennessee and Kentucky phosphate rock sold or used by producers, 1918–1927

Year	Brown rock			Blue rock			Total		
	Long tons	Value at mines		Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average		Total	Average
1918	[1]374,535	[1]$1,917,546	[1]$5.12	(1)	(1)	(1)	374,535	$1,917,546	$5.12
1919	475,475	3,123,565	6.57	58,550	$290,951	$4.97	534,025	3,414,516	6.39
1920	556,177	4,425,761	7.96	78,671	518,234	6.59	634,848	4,943,995	7.79
1921	252,543	1,666,358	6.60	25,163	146,198	5.81	277,706	1,812,556	6.53
1922	344,231	2,055,579	5.97	9,078	51,803	5.71	353,309	2,107,382	5.96
1923	427,799	2,335,262	5.46	919	5,647	6.14	428,718	2,340,909	5.46
1924	375,260	1,958,272	5.22	21,378	81,766	3.82	396,638	2,040,038	5.14
1925	[1]477,077	[1]2,429,059	[1]5.09	(1)	(1)	(1)	477,077	2,429,059	5.09
1926	[1]464,192	[1]2,048,272	[1]4.41	(1)	(1)	(1)	464,192	2,048,272	4.41
1927[2]	[1]481,769	[1]2,318,785	[1]4.81	(1)	(1)	(1)	481,769	2,318,785	4.81

[1] Blue rock included with brown rock.
[2] Figures for 1927 represent Tennessee only; no sales reported from Kentucky.

WESTERN STATES

The Western States usually produce between 1 and 2 per cent of the total United States production; in 1927 they furnished 1.6 per cent of the total.

The total quantity sold or used by the producers of the Western States in 1927 was 51,510 long tons; of this total, Idaho produced 45,260 tons, valued at $259,405, and Wyoming 6,250 tons, valued at $29,000. The phenomenal gain in 1925 was followed by a slightly greater loss in 1926 to a little below the 1924 figures. A recovery of 40 per cent of the 1926 loss was made in 1927. Production in 1927, however, was still considerably below the peak of 1920 and was only 71 per cent of the maximum production of 1925. The average value per ton of the rock sold increased $1.29—from $4.31 in 1926 to $5.60 in 1927. With the exception of 1923, the average value in 1927 was greater than in any other year since 1906. The total value of production in 1927 has been exceeded only in the two peak years of 1920 and 1925.

Three producing companies were operating in 1927, two of them in Idaho and one in Wyoming. They were as follows:

Anaconda Copper Mining Co. (fertilizer department), Conda, Idaho.
San Francisco Chemical Co., 332 Pine Street, San Francisco, Calif. Mine at Montpelier, Idaho.
Cokeville Phosphate Co., Cokeville, Wyo.

The western deposits are oolitic phosphatic marine strata of Permian age. The productive beds are thick, usually 5 feet or more and are mined by underground methods. The rock mined is relatively dry, but some of the producers run it through a dryer before shipping. The larger portion of the production, that from Conda, Idaho, is made into treble superphosphate and phosphoric acid at Anaconda, Mont.

The greater part of the phosphate-bearing area of the Western States is on public land, although some has passed into private ownership. In 1908 the Government created the western phosphate reserve. On July 31, 1927, the total classified and withdrawn lands in the western phosphate area amounted to 2,263,975 acres, of which the total outstanding phosphate withdrawals were 1,966,390 acres.

Western States phosphate rock sold or used by producers, 1918–1927

Year	Long tons	Value at mines		Year	Long tons	Value at mines	
		Total	Average			Total	Average
1918	11,955	$42,161	$3.53	1923	30,335	$175,713	$5.79
1919	16,935	69,855	4.12	1924	38,570	194,569	5.04
1920	55,609	304,006	5.47	1925	72,631	319,498	4.40
1921	6,291	25,872	4.11	1926	37,577	162,020	4.31
1922	4,481	19,692	4.39	1927	51,510	288,405	5.60

IMPORTS OF PHOSPHATIC FERTILIZERS

Both the quantity and value of all kinds of phosphatic fertilizers imported into the United States were greater in 1927 than in 1926. The phosphatic fertilizers imported were bone dust or animal carbon, bone ash, guano, crude phosphates, and basic slag. Imports of the bone-dust group increased 17 per cent in quantity and 12 per cent in value over 1926. Imports of guano nearly doubled in quantity and more than doubled in value. The quantity of crude phosphates imported increased 62 per cent due largely to two shipments of phosphate rock, totaling 10,641 tons, from French Morocco. In regard to these two shipments, the Secretary of the Treasury, acting under section 201 (a) of the antidumping act of 1921, issued a finding on February 9, 1928, in which he stated:

> After due investigation I find that phosphate rock from Morocco is being sold and is likely to be sold in the United States at less than its fair value, and that the industry of mining and selling phosphate rock in the United States has been and is likely to be injured by reason of the importation of phosphate rock into the United States from Morocco.

The quantity of basic slag imported again increased in 1927, reaching 1,625 tons. This is the largest importation since 1914 but is only 18 per cent of that year's imports.

Phosphatic fertilizers imported for consumption in the United States, 1923–1927

Fertilizer	1923		1924		1925		1926		1927	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Bone dust, or animal carbon, and bone ash, fit only for fertilizing	54,143	$1,691,330	22,242	$706,727	24,981	$724,473	46,715	$1,380,103	54,586	$1,540,897
Guano	28,599	1,104,003	25,241	754,234	17,407	730,046	11,673	430,203	23,321	898,205
Phosphates, crude	6,725	92,263	16,098	181,515	2,735	37,932	17,378	192,611	28,195	292,871
Slag, basic, ground or unground	361	6,843	703	9,598	181	2,815	269	3,485	1,625	18,945

EXPORTS OF PHOSPHATE ROCK

Exports of phosphate rock from the United States increased 23 per cent in quantity and 7 per cent in value in 1927 over 1926. In quantity the exports were higher in 1927 than in any year since 1920; in value, however, the 1927 exports have been exceeded in every year since 1920, with the single exception of 1926. Increases over 1926 were shown in quantity of both hard rock and land pebble exported; the value of the land pebble exported increased, but the value of high-grade rock exported decreased.

Of the total exports in 1927, 77 per cent went to Europe. Germany was the best customer in 1927, taking more than in any year since 1924, and taking 24 per cent of the total exports in 1927.

The average value per ton of the high-grade rock exported in 1927 was $6.90; the range in value was from $5 to $7, depending upon the country of destination. The average value at the mine of the hard rock sold in 1927 was $4. Ninety-nine per cent of the high-grade rock exported in 1927 went to Europe; the best customers, in order of quantity, were Germany, Poland and Danzig, and Belgium. A small shipment went to France in 1927, the first recorded.

The average value per ton of the "land pebble and other" rock exported in 1927 was $4.87, with a range from $3.67 for exports to Japan to $6.19 to Poland and Danzig. Seventy-four per cent of such exports in 1927 went to Europe; the best customers in order of quantity were Japan (17 per cent of the total), Netherlands, Germany, Italy, and Spain.

Phosphate rock, ground or unground, exported from the United States, 1918–1927

Year	High-grade rock		Land pebble		Other		Total	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1918	57,771	$445,419	64,559	$303,758	21,125	$163,308	143,455	$912,485
1919	215,039	2,261,852	128,860	904,308	34,832	401,822	378,731	3,567,982
1920	344,896	4,496,457	693,355	5,593,814	31,461	479,904	1,069,712	10,570,175
1921	182,594	2,592,541	544,425	4,627,875	6,293	99,721	733,312	7,320,137
1922	202,300	2,548,587	512,777	3,269,179	4,217	40,401	719,294	5,858,167
1923	194,339	2,477,501	630,565	3,273,006	2,647	21,664	827,551	5,772,171
1924	150,746	1,814,194	656,005	3,209,965	12,022	96,673	818,773	5,120,832
1925	158,985	2,283,076	697,891	3,287,370	13,324	107,317	870,200	5,677,763
1926	103,572	1,195,729	634,362	3,155,732	11,029	84,129	748,963	4,435,590
1927	128,774	888,732	[1] 789,437	[1] 3,842,830	(1)	(1)	918,211	4,731,562

[1] "Other" included with land pebble; not separately recorded.

Phosphate rock, ground or unground, not acidulated, exported from the United States, 1923–1927, by countries

HIGH-GRADE ROCK

Country	1923		1924		1925		1926		1927	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Australia	------	------	------	------	------	------	12,500	$187,500	------	------
Belgium	33,650	$484,950	19,500	$292,500	28,000	$420,000	16,125	219,275	11,950	$81,820
Canada	------	------	------	------	1,490	7,826	2,443	10,784	1,145	6,747
France	------	------	------	------	------	------	------	------	1,050	7,350
Germany	134,586	1,700,187	92,021	1,031,819	90,374	1,284,285	23,525	232,775	94,725	653,495
Mexico	------	------	------	------	------	------	4	70	------	------
Netherlands	8,140	77,720	26,494	355,195	35,221	512,465	12,175	152,225	3,550	24,850
New Zealand	------	------	------	------	------	------	12,625	136,575	------	------
Nicaragua	------	------	------	------	------	------	------	------	4	20
Norway	------	------	------	------	------	------	2,100	36,500	4,200	29,400
Poland and Danzig	11,420	171,300	6,000	90,000	3,900	58,500	8,775	106,925	12,150	85,050
Spain	3,000	15,000	------	------	------	------	------	------	------	------
Sweden	------	------	6,731	44,680	------	------	13,300	113,100	------	------
United Kingdom:										
England	3,543	28,344	------	------	------	------	------	------	------	------
	194,339	2,477,501	150,746	1,814,194	158,985	2,283,076	103,572	1,195,729	128,774	888,732

Phosphate rock, ground or unground, not acidulated, exported from the United States, 1923–1927, by countries—Continued

LAND PEBBLE[1]

Country	1923		1924		1925		1926		1927	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Argentina	1,700	$7,650	------	--------	------	--------	------	--------	------	--------
Australia	------	--------	------	--------	------	--------	36,236	$227,257	27,332	$165,492
Belgium	61,434	336,874	38,469	$196,636	36,731	$184,338	43,551	220,443	20,716	104,186
British South Africa	------	--------	6,620	34,755	21,592	117,456	13,513	75,297	10,380	59,685
Canada	10,031	54,468	7,019	40,551	12,957	65,987	14,060	74,832	17,848	104,173
Cuba	23,433	83,022	33,672	156,455	5,825	31,815	14,529	70,754	21,754	106,773
Denmark	57,425	330,323	38,072	171,176	39,783	189,011	69,868	362,541	43,755	193,224
Finland	2,000	14,000	------	--------	------	--------	------	--------	9,269	50,426
France	31,466	180,509	8,798	43,641	3,310	15,343	------	--------	------	--------
Germany	133,948	701,883	129,213	628,143	92,946	529,072	65,559	338,440	125,661	693,367
Greenland	3,685	16,597	------	--------	------	--------	------	--------	------	--------
Irish Free State	(2)	(2)	(2)	(2)	3,300	10,725	------	--------	------	--------
Italy	20,915	96,540	58,419	290,391	69,927	330,373	86,927	439,382	87,612	409,193
Japan	14,225	50,081	45,733	161,423	95,245	281,401	95,809	343,473	131,137	480,780
Latvia	------	--------	------	--------	------	--------	------	--------	12,139	63,198
Netherlands	67,702	337,371	97,368	472,666	100,293	475,832	65,373	330,904	127,981	606,491
New Zealand	------	--------	------	--------	------	--------	6,162	33,891	------	--------
Nicaragua	3,029	15,931	------	--------	------	--------	------	--------	------	--------
Norway	------	--------	2,000	9,000	3,150	14,375	------	--------	------	--------
Poland and Danzig	3,028	20,742	13,366	70,420	10,900	69,315	3,139	19,776	25,204	155,943
Spain	92,326	492,936	110,146	648,779	108,485	551,329	94,522	518,802	72,363	369,350
Sweden	10,609	62,551	12,023	64,762	61,233	294,504	5,839	32,115	29,794	175,466
United Kingdom:										
England	55,093	299,757	33,805	134,774	32,214	126,494	19,275	67,825	26,492	105,083
Ireland	20,612	94,303	3,000	9,000						
Scotland	17,904	77,468	18,282	77,393						
	630,565	3,273,006	656,005	3,209,965	697,891	3,287,370	634,362	3,155,732	789,437	3,842,830

ALL OTHER PHOSPHATE ROCK[1]

Country	1923		1924		1925		1926		1927	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Belgium	------	--------	------	--------	------	--------	500	$2,000	(1)	(1)
Canada	1,600	$17,137	10,941	$80,246	13,324	$107,317	6,649	61,301		
Cuba	------	--------	81	1,427	------	--------	------	--------		
Dominican Republic	------	--------	------	--------	------	--------	60	200		
Netherlands	------	--------	------	--------	------	--------	3,820	20,628		
Newfoundland and Labrador	29	228	------	--------	------	--------	------	--------		
Norway	------	--------	1,000	15,000	------	--------	------	--------		
Sweden	1,006	4,024	------	--------	------	--------	------	--------		
West Indies ("Other British")	12	275	------	--------	------	--------	------	--------		
	2,647	21,664	12,022	96,673	13,324	107,317	11,029	84,129	(1)	(1)

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[1] Classification for 1927 reads "Land pebble and other"; not separately recorded.

[2] Included under "United Kingdom."

EXPORTS OF SUPERPHOSPHATES AND OTHER FERTILIZER MATERIALS

The exports of superphosphates (acid phosphates) increased markedly both in quantity (67 per cent) and value (72 per cent) over 1926. The quantity exported in 1927 was the largest since statistics on exports of superphosphates were first separately recorded in 1917. The value in 1927, however, was exceeded in 1919 and 1920.

Nitrogenous fertilizer materials and prepared fertilizer mixtures exported in 1927 decreased in both quantity and value from 1926.

Fertilizers exported from the United States, 1918–1927

Year	Superphosphates (acid phosphates)		Prepared fertilizer mixtures		Nitrogenous fertilizer materials				All other fertilizers	
					Sulphate of ammonia		Other			
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1918	6,991	$257,928	(1)	(1)	(1)	(1)	(1)	(1)	74,115	$3,359,497
1919	86,790	2,774,856	(1)	(1)	(1)	(1)	(1)	(1)	188,586	14,567,032
1920	80,993	2,949,629	(1)	(1)	(1)	(1)	(1)	(1)	205,666	15,602,658
1921	4,278	96,303	(1)	(1)	(1)	(1)	(1)	(1)	55,239	2,602,277
1922	26,781	372,279	14,416	$690,972	147,331	$8,736,611	[2] 4,219	[2] $110,386	25,462	898,061
1923	42,099	534,446	17,997	832,948	153,677	11,117,726	13,291	614,814	45,073	1,921,972
1924	45,751	588,620	35,793	1,695,472	118,367	6,918,598	4,699	283,154	44,942	1,901,722
1925	65,779	988,914	29,923	1,530,354	123,141	6,748,728	6,802	367,435	46,509	1,985,335
1926	64,452	937,278	26,439	1,009,402	181,125	9,823,847	9,639	566,306	72,164	3,267,562
1927	107,507	1,615,466	14,720	617,582	138,692	6,826,600	8,951	492,004	82,962	3,440,961

[1] Not separately classified.

[2] Includes 2,556 tons of calcium cyanamid (lime of nitrogen), valued at $26,112; not separately classified for other years.

WORLD PRODUCTION

The world production of phosphate rock in 1927 is estimated to have been about ten and one-half million tons, the largest annual production yet recorded. Decreases were shown in the production of some countries, especially Algeria and the United States. More notable, however, were the marked increases of over one-half million tons each in French Morocco and Tunisia and nearly one-quarter million tons in Nauru and Ocean Islands.

France, with its colonies, leads the world in phosphate rock production, producing about 54 per cent of the total world production in 1927. The United States produced 30 per cent and the British Empire 9 per cent. No other nation produced over 3 per cent of the world total.

The French North African colonies had a net increase of 1,014,000 metric tons in 1927 over 1926, due to an increase of 1,024,000 tons in French Morocco and Tunisia. Algeria, the other French North African colony, however, suffered a loss of 10,247 tons in 1927.

Of the individual countries in 1927 the United States was still the leading producer, with 3,221,589 metric tons, but it exceeded Tunisia, second in output, by only 146,589 tons. Third place was taken from Algeria by French Morocco in 1927, with a marketed production of 1,198,006 metric tons. Algeria, in fourth place, had a production of 919,108 metric tons.

The Florida land-pebble phosphate rock area, which for many years has been the largest individual phosphate rock-producing area in the world, was surpassed in 1927 by the Tunisian field.

World production of phosphate rock, 1923–1927, by countries, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
Algeria	467,384	681,136	815,116	929,355	919,108
Angaur Island	61,243	[1] 61,000	[1] 61,000	[1] 61,000	[1] 61,000
Australia:					
New South Wales	75	109	203	257	132
South Australia	453	85	754	896	761
Victoria	488	541		122	
Belgium	23,270	26,250	15,125	30,030	(2)
Canada [3]	27		15	36	137
Christmas Island (Straits Settlements) [4]	71,563	127,166	111,835	131,057	118,553
Egypt	25,370	87,869	106,778	232,008	279,389
Estonia	304		2,044	4,054	3,576
France	179,462	206,859	230,496	253,279	(2)
Germany: [3]					
Bavaria	2,975	1,000	200		
Prussia	2,311	399	123	542	443
Gilbert and Ellice Islands [5]	136,506	192,516	(2)	(2)	(2)
India (British)	4,838	6,529	1,504	730	613
Indo-China	9,847	12,461	30,236	14,511	20,700
Japan	33,107	85,617	87,375	108,569	75,386
Madagascar		[4] 749	449	6,135	6,480
Makatea Island [4]	74,230	89,611	81,061	127,177	135,666
Morocco, French	225,395	461,582	692,181	882,821	1,400,000
Nauru and Ocean Islands [5]	318,794	459,162	478,278	398,059	633,345
Netherland West Indies: Curaçao [4]	85,855	100,471	81,771	106,807	108,881
New Caledonia	12,932	[4] 8,169	12,000	[4] 10,647	9,000
New Zealand	2,421	1,600			
Norway [3]	222	345	467	343	
Philippine Islands	3,781	6,528	7,528	7,512	705
Russia [6]	30,492	28,380	39,824	72,516	56,460
Seychelles Islands [4]			3,259	3,259	11,511
Spain	5,397	6,746	5,315	5,656	4,202
Tunisia	2,338,000	2,391,000	2,691,000	2,568,000	3,075,000
United States	3,054,964	2,913,817	3,537,702	3,261,496	3,221,589

[1] Estimated.
[2] Data not available.
[3] Apatite.
[4] Exports.
[5] Exports during the fiscal year ended June 30 of the year stated.
[6] Year ended Sept. 30.

COAL

By F. G. Tryon, O. E. Kiessling, and L. Mann[1]

ACKNOWLEDGMENTS

This report marks the forty-sixth year of the continuous statistical record of coal production in Mineral Resources of the United States. Like its predecessors, the report is made possible by the voluntary cooperation of those interested in the coal industry; and it is a pleasure to record the generous support of the thousands of individual producers, distributors, and consumers who have supplied information.

Particularly valuable has been the help afforded by the traffic managers of the coal-originating railroads, who have furnished detailed records of shipments on their lines. For the weekly and daily information on cars of coal loaded, which forms the principal basis of the current estimates of weekly production, the bureau is under obligations to M. J. Gormley, chairman of the car service division of the American Railway Association, and particularly to H. E. Ewin and G. W. Freeburg. Current records of shipments by waterways have been furnished by the United States Engineers.

Acknowledgment is also made of the generous help of the State mine inspectors, who have assisted in the collection of returns by furnishing information in their files, thereby increasing the accuracy of the statistics. Help has been given by W. B. Hillhouse, chief mine inspector, Birmingham, Ala.; Claude Speegle, State inspector of mines, Fort Smith, Ark.; James Dalrymple, chief inspector of coal mines, Denver, Colo.; A. D. Lewis, director, department of mines and minerals, Springfield, Ill.; A. C. Dally, chief mine inspector, Indianapolis, Ind.; J. R. Frank, secretary to the mine inspectors, Des Moines, Iowa; James Sherwood, State mine inspector, Pittsburg, Kans.; W. H. Jones, chief inspector of mines, Lexington, Ky.; John J. Rutledge, chief mine engineer, Maryland bureau of mines Baltimore, Md.; F. G. Fenix, chief inspector, Joplin, Mo.; Edward Davies, State coal-mine inspector, Helena, Mont.; A. Waddington, State coal-mine inspector, Bismarck, N. Dak.; O. W. Brach, chief, division of labor statistics, Columbus, Ohio; Frank Hall, deputy secretary of mines, department of mines, Harrisburg, Pa.; O. P. Pile, chief mine inspector, Nashville, Tenn.; William R. Reese, chief mine inspector, Seattle, Wash.; R. M. Lambie, chief, department of mines, Charleston, W. Va.; and Hugh McLeod, chief coal-mine inspector, Rock Springs, Wyo.

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[1] The work incident to the preparation of coal statistics was done by the following employees of the Bureau of Mines: Compilation of the annual statistics of bituminous coal was conducted by L. Mann, with the assistance of J. M. Corse; the statistics of anthracite were compiled by H. L. Bennit; the monthly and weekly estimates of production were prepared by R. McKinney; the distribution tables by R. McKinney and G. S. Goodman; the figures of consumers' stocks were compiled by H. O. Rogers, who also conducted the study of preparation; the data on world production were compiled by L. M. Jones; and the tables of exports and imports were compiled from the records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey. The sections on seasonal fluctuations in production, preparation (sizing and cleaning), loading machines underground, and consumption are adapted from special studies by F. G. Tryon and H. O. Rogers, to be published elsewhere. O. E. Kiessling wrote the market review and the section on anthracite and collaborated with F. G. Tryon in writing the other sections of the report. The anthracite section of the report was printed in advance of the report as a whole and distributed in March, 1929, under the title "Anthracite in 1927, by O. E. Kiessling and H. L. Bennit."

The bureau finds of especial value the cooperation of the secretaries of local associations of coal operators, on account of their intimate knowledge of conditions in their several districts. Many of them have supplied current reports of production by fields. For information on 1927 the bureau is indebted to F. O. Sandstrom, secretary, Colorado and New Mexico Coal Operators' Association, Denver, Colo.; F. C. Honnold, manager, Honnold Coal Bureau, Chicago, Ill.; O. L. Lumaghi, secretary-treasurer, Coal Operators' Association of the fifth and ninth districts of Illinois, St. Louis, Mo.; Jonas Waffle, traffic manager, Indiana Bituminous Coal Operators' Association, Terre Haute, Ind.; C. J. Neekamp, secretary, Northeast Kentucky Coal Association, Ashland, Ky.; C. E. Reed, secretary, West Kentucky Coal Bureau, Louisville, Ky.; J. E. Johnson, secretary, Hazard Coal Operators' Exchange, Lexington, Ky.; E. R. Clayton, secretary, Harlan County Coal Operators' Association, Harlan, Ky.; D. F. Hurd, secretary, Eastern Ohio Coal Operators' Association, Cleveland, Ohio; R. E. Howe, secretary, Southern Appalachian Coal Operators' Association, Knoxville, Tenn.; C. B. Neel, secretary, Virginia Coal Operators' Association, Norton, Va.; C. H. Mead, secretary, Winding Gulf Operators' Association, Beckley, W. Va.; S. C. Higgins, secretary-traffic manager, New River Coal Operators' Association, Mount Hope, W. Va.; C. C. Morfit, secretary, Tug River Operators' Association, Welch, W. Va.; D. C. Kennedy, secretary, Kanawha Coal Operators' Association, Charleston, W. Va.; George Bausewine, jr., secretary, Operators' Association of Williamson Field, Williamson, W. Va.; W. L. A. Johnson, general commissioner, Southwestern Interstate Coal Operators' Association, Kansas City, Mo.; and W. E. Maltby, manager, Washington Coal Producers' Association, Seattle, Wash. To these and many others who have supplied information cordial acknowledgment is made.

REVIEW OF THE COAL INDUSTRY IN 1927

BITUMINOUS COAL

In the bituminous coal fields 1927 marked a return of the depression which in 1924 and 1925 had left in its wake declining prices, narrow profits or absolute losses, abandoned mines, and unemployment. In 1926 the causes of instability latent in the industry were obscured temporarily by a chance combination of transient conditions that buoyed up the industry. With the removal of these factors in 1927 the forces making for readjustment and liquidation pressed down upon the industry with new vigor.[2] During the year three major influences dominated the soft-coal market—a decline in demand due to lower domestic consumption and to a loss in overseas exports, an accumulation of huge reserves against the anticipated suspension at the expiration of the Jacksonville agreement on March 31, and the maintenance of adequate supplies continually throughout the year.

With the exception of 1924 the production of bituminous coal in 1927 was the lowest for any of the past five years. (See fig. 5.) The output of 517,763,000 tons—although only slightly lower than that for 1925—represents a decline of 9.7 per cent from 1926 and of 8.3

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[2] Tryon, F. G., Kiessling, O. E., and Mann, L., Coal in 1926: Mineral Resources of the United States, 1926, Pt. II, Bureau of Mines, 1928, pp. 443–456.

per cent from 1923, the latest relatively "good" years. Weekly and monthly production during the first quarter of 1927 proceeded at a high rate in striking contrast to the record during the remainder of the year. (Tables 14 and 17, and fig. 1.) Output for the first quarter was 169,268,000 tons or at the rate of 678,000,000 tons a year, in comparison with 116,809,000 tons and 125,409,000 tons in the third and fourth quarters, respectively. Production for March was 59,911,000 tons, a gain of 698,000 tons over the previous monthly record, established in November, 1926. The Lake cargo movement in 1927 was the largest in the history of the Lake trade, and exports to Canada were the largest since 1923.

Decline in industrial consumption.—A part of the decline in demand in 1927 was due to lower consumption. The consumption of bituminous coal for all purposes, excluding exports and additions to stocks, was 499,801,000 tons, or a loss of 6.2 per cent from the 532,581,000 tons consumed in 1926. Some of this loss is accounted for by the mild temperatures which cut down the demands for house-heating and by the recovery of anthracite in the domestic-fuels market. In a larger measure, however, it is explained by lessened general activity of industry which reduced the demand for fuel for industrial purposes. A high volume of output in most lines of business during the early months was followed by a steady downward trend of business barometers during the remainder of 1927.[3] For the year manufacturing production showed a decrease of 2 per cent from 1926, a reduction which was largely due to declines in the output of pig iron, steel ingots (see fig. 14), automobiles, and lumber—the first two of which require a large consumption of coal per unit of product.[4] The railroads also used less bituminous coal in 1927 than in 1926. (See fig. 13.) Reacting to a decrease of 3 per cent in freight traffic and to increased efficiency in fuel utilization, locomotives of Class I railroads consumed 6,940,000 tons less than in the preceding year.

Loss in the overseas trade in 1927.—With domestic industry requiring less coal, demand was further depressed by a loss of overseas business. From 21,510,000 net tons in 1926, when the overseas trade was greatly stimulated by the world-wide demand for coal caused by the British strike, sea-borne exports of bituminous coal fell to 3,288,000 tons in 1927. With the exception of 1922, when domestic production was restricted by a strike, this is the smallest sea-borne movement since 1911. In comparison with 1926 there was a decline of 15,013,000 net tons in shipments to Europe, 1,989,000 tons to South America, and 1,018,000 tons in shipments to Africa. Exports of American coals to France, Italy, and Brazil were considerably below normal. In addition, the quantity of bunker coal loaded into vessels engaged in foreign trade was 3,170,000 net tons less than in 1926 and 300,000 less than in 1925. A gain of about a million tons in exports to Canada in 1927 fell far short of offsetting the combined loss of 21,390,000 net tons suffered in the overseas markets and in the bunker trade.

Coal stocks high in 1927.—The accumulation of large coal reserves in the first half of 1927 was a major influence in the state of the

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[3] Federal Reserve Bulletin, vol. 14, No. 1, January, 1928, p. 1.
[4] Bureau of the Census, Survey of Current Business: No. 78, February, 1928, p. 11.

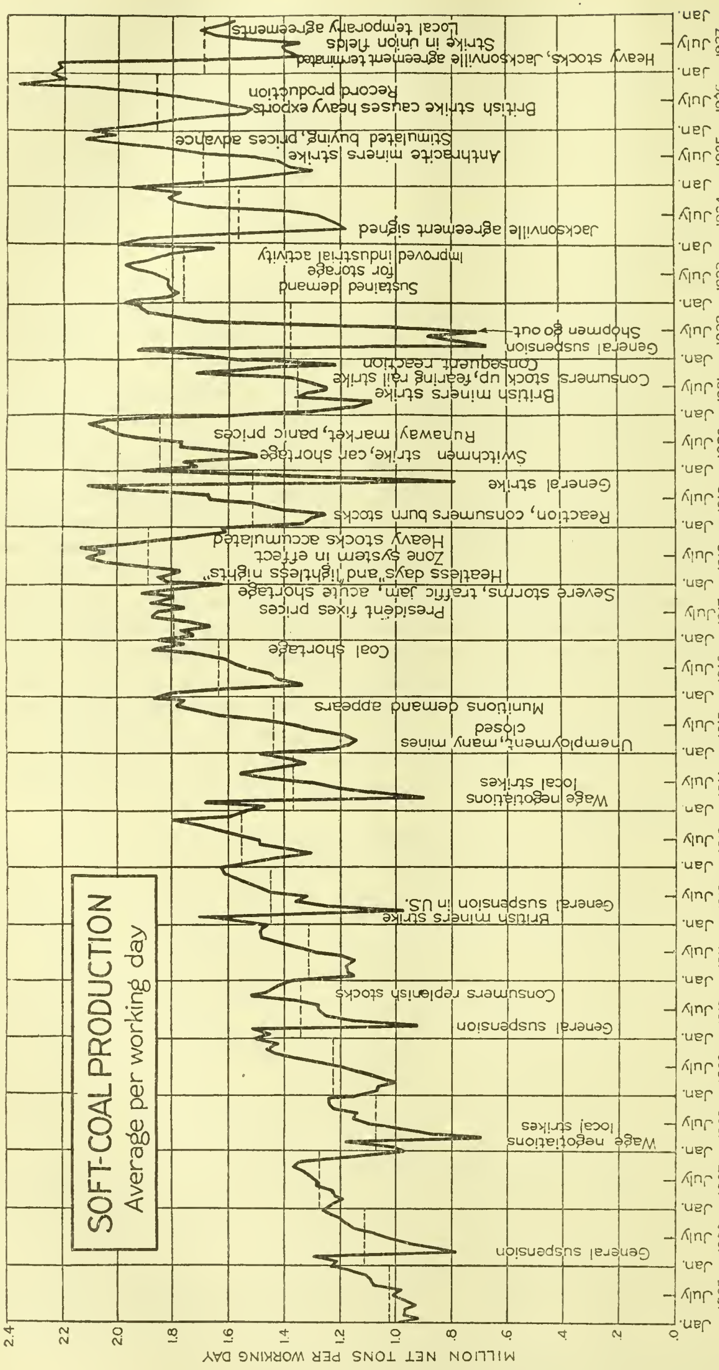

FIGURE 1.—Average production of bituminous coal per working day in each month, 1905–1927

market throughout the year. In addition to purchases for active current consumption during the first three months, there was a heavy demand for storage. Previously (between October and December, 1926) stocks had increased from 43,000,000 tons to 55,000,000 tons, both because of the fear that the extraordinary export demand might carry prices higher and because of the apprehension felt concerning supply after the expiration of the Jacksonville agreement on March 31, 1927. Between January and April, 1927, reserves were further increased in anticipation of the suspension that seemed inevitable. On April 1 they amounted to 75,000,000 net tons, the largest quantity ever reported in storage by consumers. (See fig. 2.) With the cessation of work by the union miners on April 1 and the consequent curtailment of output in the organized fields stocks were reduced but slowly during the summer. On August 1 they amounted to 60,100,000 tons, and at the end of December the large reserve of 55,500,000 tons was still on hand. The net addition to consumers' stocks in 1927 was thus 500,000 tons. The year began and ended with large reserves, and the outstanding event in the movement of stocks was the unusual quantity in storage to meet any emergency following restriction of production in the union fields. At all times stocks were sufficient to insure a quiet market, and for no year since the beginning of the record in 1916 were they maintained consistently at such a high level as in 1927.

Production in 1927 and the suspension in the union fields.—During the first quarter of 1927 production responded to heavy demands for industrial consumption and for storage and continued at the high level prevalent in the last half of 1926. From January to March the daily average production exceeded 2,000,000 tons, a figure never reached again during the remainder of the year. (Fig. 1.) Output for March—59,911,000 tons—exceeded the previous monthly record, established in November, 1926, by 698,000 tons. Production in April, however, declined 42.4 per cent, and the monthly rate continued at about 35,000,000 tons until August. From April 1 until the end of the year the course of production was primarily affected by the condition of consumers' stocks, already noted, and by the suspension of operations in the unionized soft-coal fields.

The suspension of bituminous coal mining in certain union districts, notably the central competitive field, embracing Illinois, Indiana, Ohio, and western Pennsylvania, began on April 1, 1927. According to the Bureau of Labor Statistics, Department of Labor, the strike involved directly about 175,000 workers, exclusive of 15,000 men in central Pennsylvania who suspended work on July 1.[5] It affected more or less severely mining operations in at least nine States—Illinois, Pennsylvania, Ohio, Indiana, Arkansas, Kansas, Oklahoma, Missouri, and Iowa. An agreement was reached in Illinois on or about October 1 whereby the mines would resume operation until April 1, 1928, under the Jacksonville scale, while a study was being made of the mine situation by a commission of four, composed of two executives from the operators and two from the miners. Settlements along similar lines were made in Iowa on October 4, in the southwestern district on October 6, and in Indiana on October 7. No

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[5] Bureau of Labor Statistics, Monthly Labor Review: Vol. 27, No. 1, July, 1928, p. 92.

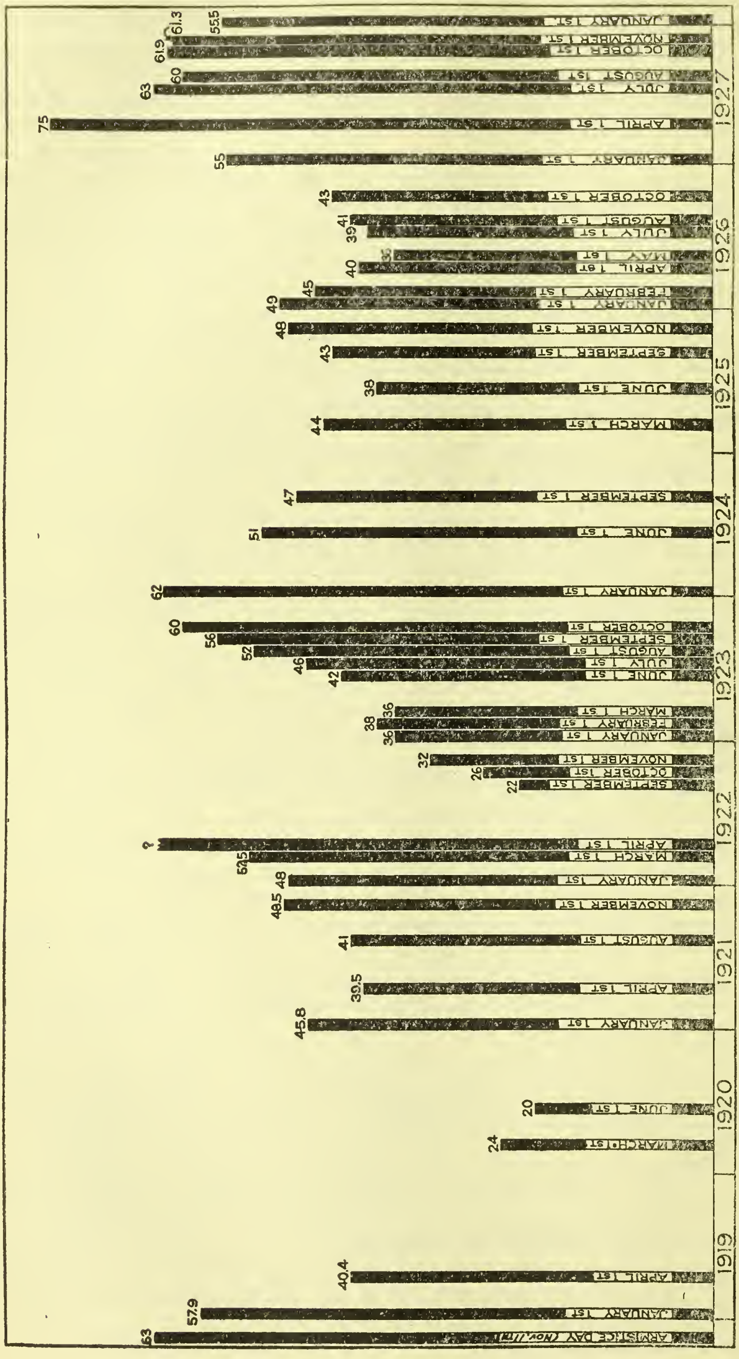

FIGURE 2.—Total commercial stocks of bituminous coal, November 11, 1918, to January 1, 1928

settlement between the miners and the operators was reached in Ohio and Pennsylvania.

The larger part of the decline in total output after the beginning of the suspension reflected the cessation of work in the union fields north of the Ohio River. While production in these areas was being restricted activity in the important nonunion States south of the Ohio increased. A comparison of production for the seven months from April to October, 1927, with the corresponding period in 1926 shows a decline of 77.8 per cent in Illinois, 45.9 per cent in Indiana, 14.1 per cent in Pennsylvania, and 67.8 per cent in Ohio. The production of Kentucky, on the contrary, increased 19.2 per cent and of West Virginia 6 per cent. The restriction in the union districts, therefore, was counteracted by an expansion of mining in the two largest producing States south of the Ohio which had easiest access to the markets normally served by the Northern States. While this expansion, measured in tons, was not sufficient to keep production at the high level of the early months, still it was adequate to supply amply all current demands, and between April and October only 13,100,000 tons was withdrawn from storage.

With the resumption of mining in the majority of the union districts in October heavy stocks and relatively weak demand became factors depressing production. Stocks on October 1 were 61,900,000 tons, or one-third above the quantity needed to insure a quiet market. During the last quarter the demand for new-mined coal was reduced by a partial liquidation of these large reserves when 6,400,000 tons was withdrawn from storage. Also, the notable reduction in manufacturing activity in the last three months of 1927 below that for corresponding periods in 1925 and in 1926 was accompanied by a commensurate decline in the coal demand for industrial purposes. Reacting to these conditions monthly production remained at about 40,000,000 tons until the end of the year.

Prices in 1927.—Connected with the provision of ample supplies during the year was the decline in prices that characterized the coal market in 1927. Coal Age's weighted average spot price for 14 coals f. o. b. mine showed a progressive decline from January until August. (See fig. 3.) The average for January was $2.34; by June, when the suspension was seriously curtailing mining in the union fields, it had fallen to $1.85. An increase in prices, begun in August, brought the average to $2.07 for September, when western railroads buying in eastern and southern fields temporarily strengthened the general spot market.[6] Prices fell, however, during the last quarter of the year, and the weighted average for December was only $1.90. The average of $1.99 for the year was the lowest reported for any similar period since 1916. The fall in the general average spot price indicates the reductions occurring in most markets throughout the country. Spot prices of southern West Virginia smokeless run-of-mine on the Boston market, as quoted by Coal Age, declined each month from $2.41 in January to $1.39 in November. The averages of the quotations on western Kentucky mine-run on the Chicago and Louisville markets fell from $1.64 in April to $1.16 in December, and the spot prices of southern Illinios mine-run on the Chicago market decreased from $2.63 to $2.38 in the same period.

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[6] Coal Age, vol. 33, No. 1, January, 1928, p. 54.

The trend of spot prices is a good indication of the level of sales realizations in 1927. For the industry as a whole the average sales realization on all coal produced in 1927 was $1.99, exactly the same as Coal Age's average spot price. Like the latter, it is the lowest average realization for any year since 1916 and represents a loss of 7 cents from 1926 and 69 cents from 1923. Not only were the demands of the consumer adequately supplied in 1927 in spite of the curtailment due to the suspension, but the average price paid per ton was lower than for any other year in the past decade.

Increase in the Lake cargo movement.—The Lake cargo movement in 1927 was the largest in the history of the Lake trade. The total quantity loaded into vessels at Lake Erie piers was 34,302,000 tons, of which 32,852,000 tons was cargo coal. Cargo dumpings exceeded those of 1926 by 4,693,000 tons and were 3,023,000 tons above the record of 29,829,000 tons established in 1923. More than one-half of the gain in shipments in 1927 was made in April, when total loadings were 3,374,000 tons in comparison with 950,000 tons in the corresponding month of 1926. The coal fields of West Virginia, eastern Kentucky, and Virginia received all the increase in the Lake trade, while those of Tennessee and the districts north of the Ohio suffered a loss in the Lake business. The Lake tonnage from West Virginia alone exceeded that of 1926 by 5,840,000 tons.

The greater portion of the large increase in 1927 represented shipments to American ports. Shipments to Canada were 455,000 tons more than in 1926, while shipments to American ports on Lake Superior increased by 2,512,000 tons and to those on Lake Michigan by 1,072,000 tons.

The sharp increase in the Lake trade in 1927 is explained by the suspension in the central competitive area. Curtailment in the northern field occurred just after the Lake movement was under way. Communities in the Middle West and North Central West that ordinarily relied on supplies of all-rail coal from the union fields turned for partial relief to nonunion coal brought via the Lakes, and the Lake movement felt the full impact of this demand. Although there was virtual elimination of tonnage destined for Lake traffic from the union districts in Ohio and Pennsylvania, increased shipments from West Virginia and Kentucky quieted any apprehension concerning supply.

Increase in coastwise shipments to New England.—The same factors that increased the Lake trade also stimulated the tidewater movement to New England. The total receipts of bituminous coal in New England during 1927 were 22,340,000 net tons, of which 15,108,000 tons came by tide and 7,232,000 all-rail. Receipts by water were the largest in the history of the trade, while receipts by rail showed a reduction from the preceding two years. The proportion received by tide has grown steadily from 46.9 per cent in 1919. The sharp increase to 67.6 per cent in 1927, however, was an accentuation of the trend due to the labor difficulties, previously noted, which retarded all-rail shipments from the northeastern union areas. During the period of the suspension the increase in the tidewater movement was sufficient to bring the total receipts for each month above those in 1926. The chief beneficiaries of this increase were the southern fields, which originate the bulk of the coastwise coal destined for New England. Shipments from Hampton Roads increased from

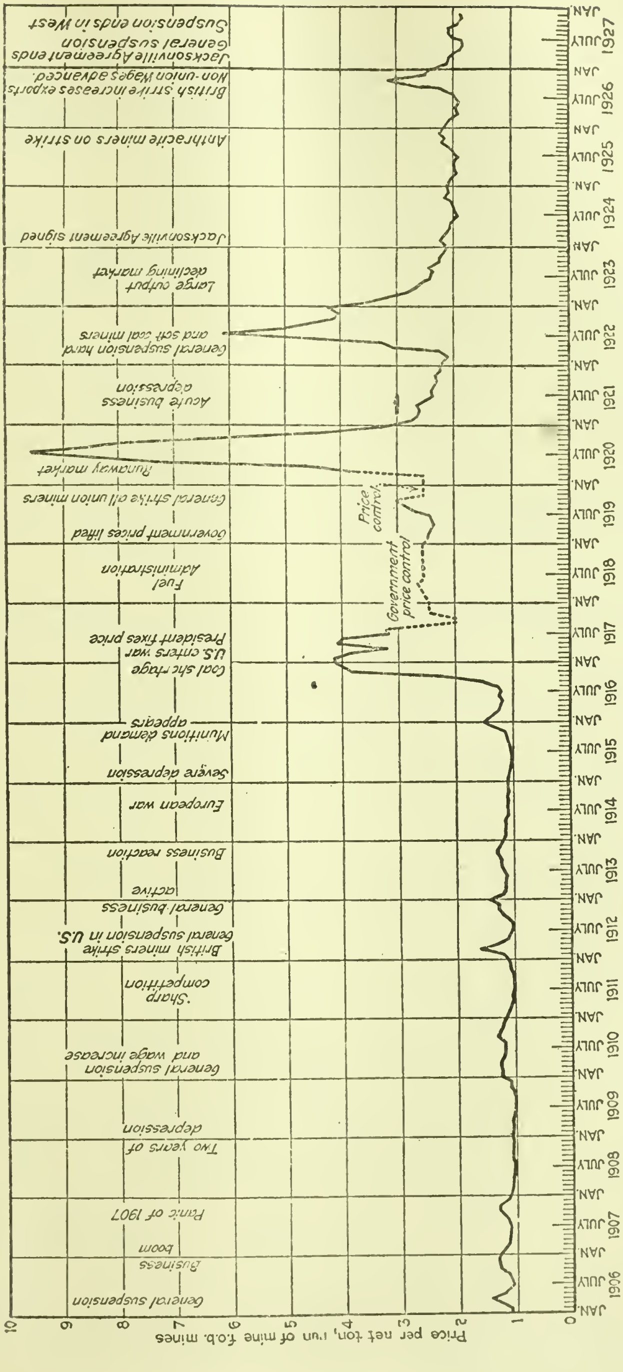

FIGURE 3.—Monthly average spot prices of bituminous coal f. o. b. mines, as quoted by Coal Age, 1906–1927

10,506,000 tons in 1926 to 12,590,000 tons in 1927, the latter figure exceeding the previous record, established in 1925, by more than a million tons.

Accentuation in the shift of production southward.—The shift of business from North to South, referred to in preceding reports (Coal in 1925, p. 397; Coal in 1926, pp. 429–430), was accentuated by the suspension that curtailed mining in the North. In comparison with 1926 the output of Illinois decreased 33 per cent, of Indiana 23 per cent, of Ohio 43 per cent, and of Pennsylvania 13 per cent. Responding to increased demands from markets normally served by the northern districts, production in Kentucky increased 10 per cent and in West Virginia 1 per cent. These two States established new records of output and were the only States east of the Mississippi to show an increase in production during the generally weak market conditions that prevailed in 1927. These increases for the year were made possible by the acceleration of production during the strike period. A comparison of production in Kentucky for the seven months from April to October, 1927, with the corresponding period in 1926, shows an increase of 19 per cent in contrast to a 10 per cent gain for the year. A similar comparison for West Virginia indicates an increase of 6 per cent during the suspension as against 1 per cent for the year. From the viewpoint of long-time trends in the industry these gains in 1927 were mainly due to transient rather than to permanent forces.

Number of employees and working time in 1927.—Although production declined approximately 10 per cent in 1927, there was no reduction in the number of workers. The total number of men employed at bituminous coal mines was 593,918 in comparison with 593,647 in 1926. Changes in the number of employees among the various States were mainly of a minor character. In Kentucky the working force increased 4,169 men over 1926, in Illinois 1,100, in West Virginia 1,073, in Missouri 962, and in Indiana 948 men; there were smaller increases in Alabama, Arizona, Arkansas, New Mexico, North Dakota, Oklahoma, and Texas. Decreases in the number of workers in the remaining States ranged from 3 in South Dakota to 3,004 in Ohio. Only in a few States did the changes in the number of workers show any degree of correlation with the changes in production that occurred in 1927.

Although the total number of employees did not decline, the fall of production was reflected by a loss in working time. The average time worked by the 7,011 commercial mines in operation in 1927 was 191 days, a decline of 24 days in comparison with 1926. The average for the entire country, however, gives an exaggerated impression of the steadiness of employment throughout the industry. Decreases from 1926 in working time, which occurred in both Northern and Southern States, were most severe in fields north of the Ohio. Thus, in Illinois the average number of days worked decreased from 172 in 1926 to 114 in 1927; in Ohio from 159 to 98; in Pennsylvania from 224 to 203; in West Virginia from 247 to 235; and in Virginia from 263 to 238. In Tennessee the average number of days worked in 1927 was 235, in Kentucky 237, and in Indiana 120. These figures indicate the great degree of variation among the coal-producing States in the steadiness of employment in 1927, as shown by the average number of days worked.

ANTHRACITE

Although no disturbance affected mining during the year, the production of anthracite in 1927 failed to equal the average of other recent years. The total output of 71,513,896 gross tons, a decrease of 3,876,686 tons when compared with 1926, is the smallest on record for any year free from labor difficulties within the past decade. In comparison with the average for the 10 years, 1918 to 1927, which amounted to 74,043,665 tons, the production of 1927 shows a decrease of 3.4 per cent. Shipments to markets outside the anthracite region were 2.3 per cent below the 10-year average and 6.4 per cent below the level of 1926.

The dominant influence that shaped the market in 1927 was the generally weak demand. By the first of the year all outward evidence of the great suspension of 1925–26 had disappeared. Uninterrupted production was assured, and reserves in retail yards were fully up to normal. With an active half year's buying just past there was every reason to expect good business to continue during the first months of 1927. Such anticipations failed to materialize because of a comparative decline in consumption.

The falling off in anthracite sales during the last half of the 1926–27 heating season was attributed by the trade largely to mild temperatures, which discouraged heavy buying. Undoubtedly the amount of hard coal burned during the first four months of the year was somewhat below normal. This, in turn, unfavorably affected the usual early spring demand for refilling the bins of consumers. Production for the first third of 1927, which amounted to 25,462,000 net tons, was 4,237,000 tons behind the corresponding period of 1924. Supplies of anthracite in the yards of representative retail dealers, sufficient for 54 days on January 1, were reduced but slightly at the beginning of the summer. The existence of these large reserves, in the face of lower production, indicated reduced consumption during the first half of 1927.

The market continued dull throughout the summer in spite of the allowance of summer discounts by the larger producers. A very mild, late autumn followed. Not only was buying light in the proximate areas, but shipments to New England, shipments via Lake Erie ports, and exports to Canada were below the figures for previous years. (Table 1A.) The suspension of mining in the union bituminous fields had little apparent effect on the anthracite trade, and a sporadic strengthening of demand in August and September did not last long. The slow turnover of dealers' stocks is indicated by a 60 days' supply in reserve on October 1, the largest figure on record. To move tonnage some independent companies, as well as retailers, were reported to have cut prices. (Coal Age, January, 1928, vol. 33, No. 1, p. 65.) Although production for the last four months was below comparative figures for 1924 and 1926, the year ended with retail stocks heavy, trade sluggish, and prices of independent domestic coal showing a tendency to decline.

An encouraging feature of the trade in 1927 was a better demand for buckwheat, mainly for domestic heating, and recovery in sales of certain of the smaller steam sizes. In contrast to 1926, independent buckwheat brought a premium for the larger part of the year. The unusual situation was even reported where some shippers demanded purchases of the larger coals before assuring prompt shipment of buckwheat. (Coal Age, January, 1928, vol. 33, No. 1, p. 55.) The situation was relieved by an increase in output and by the substitution of bituminous coal for No. 1 buckwheat by some railroads. (Coal Age, January, 1928, vol. 33, No. 1, p. 64.) Although the total output of anthracite in 1927 was below that of 1926 there was a small increase in the quantity of steam sizes marketed.

The course of anthracite prices in 1927 reflected the relatively weak demand for domestic coal. Circular prices were scrupulously adhered to as usual by the large companies. No premiums, however, were paid on domestic sizes of independent coals. For the first time since 1915 independent stove, as quoted in the New York market, remained below the company list price throughout the entire year, and for no other recent year had the independent quotation been so far below the list price as it was in 1927. The usual summer discounts, unnecessary in 1926, were offered again in the hope of stimulating buying. Partly for this reason average receipts on sales of domestic coals were lower than in 1926.

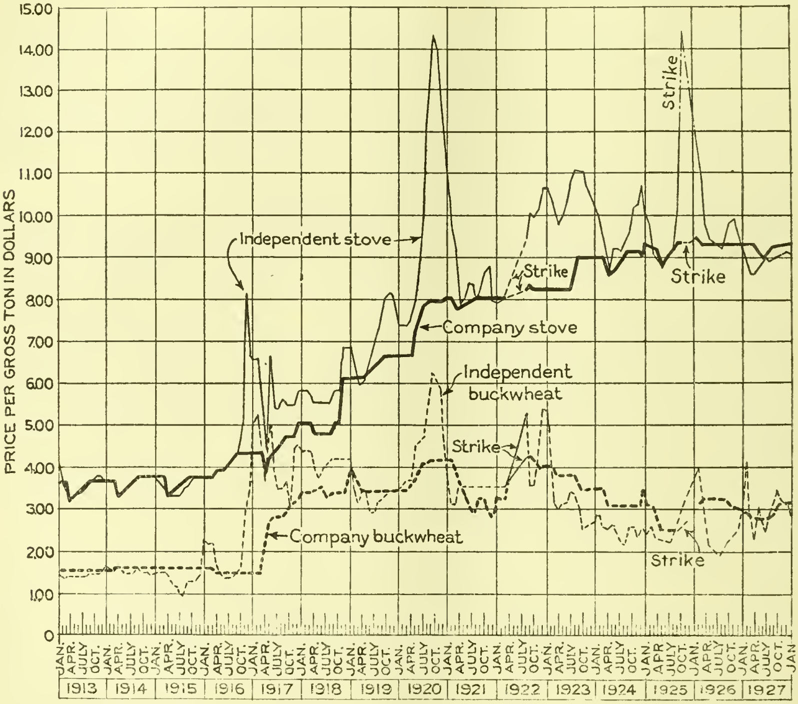

FIGURE 4.—Monthly prices of anthracite f. o. b. mines, as quoted by Coal Age, 1913–1927. Prices shown are averages of the range as quoted on the New York market

The steam sizes, on the other hand, commanded somewhat better prices in 1927 than in the preceding year. Independent buckwheat recovered from the slump that had lasted during the last half of 1926 and sold at a premium of around $1 during the first months of 1927. In late spring it dropped below the circular price, but premiums were paid again from midsummer throughout the fall. As a group, however, the steam sizes continued to feel the pressure of low-priced bituminous coal, and the average realization obtained by all producers on all sizes below pea, although larger than in 1926, was lower than in other recent years.

The average sales realization on shipments of breaker coal was $6.50 as against $6.84 in 1926. As has been mentioned, the decrease from 1926 is due partly to the fact that summer discounts were offered. Although the average for 1927 is not computed in a manner strictly comparable with years before 1926 (footnote 4, Table 19A), the break in comparability is slight, and the average receipts for total breaker shipments in 1927 can be said to approximate closely those for 1925 and 1922.

STATISTICAL SUMMARY

TABLE 1.—*Salient statistics of the coal industry in 1927*

[Figures for bituminous in net tons; anthracite in gross tons]

	Bituminous	Anthracite
Production...tons	517, 763, 352	71, 513, 896
Value at mines	$1, 029, 657, 000	$420, 942, 000
Average value per ton	$1. 99	$5. 89
Average spot price as quoted by Coal Age	$1. 99	(1)
Number of active mines of commercial size	7, 011	[2] 302
Stocks of commercial consumers:		
Jan. 1...tons	55, 000, 000	(1)
Dec. 31...do	55, 500, 000	(1)
Net change during year...do	500, 000	(1)
Exports...do	18, 012, 000	2, 969, 000
Imports...do	550, 000	106, 000
Consumption (calculated)...do	499, 801, 000	66, 671, 000
Capacity of mines with present labor force (assuming 303.5 working days in the anthracite field and 308 working days in the bituminous field)...tons	835, 000, 000	96, 000, 000
Average number of days worked	191	225
Average days idle:		
All causes	117	78. 5
Through strikes and lockouts	45	1
Other causes	72	77. 5
Average number employed:		
Miners, loaders, and shot firers	372, 565	82, 583
Haulage and track	69, 016	18, 186
Other underground	70, 525	26, 428
Surface	81, 812	38, 062
Output per man:		
Per day...tons	4. 55	[3] 2. 15
Per year...do	872	[3] 485
Number of cutting machines	17, 388	138
Quantity cut by machines...tons	374, 040, 637	1, 046, 329
Per cent of output cut by machines	72. 2	1. 5
Number of power shovels in strip pits	455	112
Quantity produced by stripping...tons	18, 378, 166	1, 922, 461

[1] Data not available. [2] Number of breakers, washeries, and dredges. [3] Net tons.

TABLE 2.—*Summary of coal produced, value, men employed, days worked, and output per man per day, by States, 1926–27*

[Note that figures relate only to active mines of commercial size; no canvass of wagon mines was made]

State	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Tota	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
1926														
Alabama	20, 008, 638	671, 616	269, 194	51, 514	21, 000, 962	$48, 036, 000	$2. 29	16, 140	3, 378	3, 506	4, 321	27, 345	266	2. 89
Alaska	82, 000	4, 450	850	------	87, 300	459, 000	5. 26	47	8	24	52	131	221	3. 02
Arizona	------	624	------	------	624	1, 000	1. 60	1	------	------	------	1	90	6. 93
Arkansas	1, 427, 798	16, 027	15, 192	------	1, 459, 017	5, 497, 000	3. 77	2, 213	251	392	733	3, 589	135	3. 00
California, Idaho, and Oregon	6, 768	10, 700	1, 240	------	18, 708	70, 000	3. 74	51	4	16	20	91	103	1. 99
Colorado	9, 623, 680	609, 237	249, 156	155, 152	10, 637, 225	29, 529, 000	2. 78	8, 160	1, 456	1, 238	1, 961	12, 815	202	[1] 4. 11
Georgia	52, 711	689	1, 344	5, 125	59, 869	173, 000	2. 89	------	------	------	127	127	253	1. 86
Illinois	64, 611, 578	3, 734, 197	1, 021, 148	------	69, 366, 923	148, 604, 000	2. 14	51, 993	8, 191	8, 104	7, 582	75, 870	172	5. 31
Indiana	22, 020, 268	748, 575	417, 163	------	23, 186, 006	45, 889, 000	1. 98	14, 664	2, 623	2, 754	3, 363	23, 404	173	5. 72
Iowa	3, 791, 893	740, 136	93, 458	------	4, 625, 487	14, 214, 000	3. 07	6, 438	748	1, 006	677	8, 869	183	2. 85
Kansas	4, 014, 876	350, 540	51, 064	------	4, 416, 480	12, 535, 000	2. 84	5, 700	590	541	1, 341	8, 172	158	3. 43
Kentucky	61, 291, 208	892, 063	491, 239	249, 952	62, 924, 462	109, 740, 000	1. 74	35, 964	7, 443	8, 257	8, 914	60, 578	230	4. 52
Maryland	2, 955, 589	105, 283	17, 481	------	3, 078, 353	6, 800, 000	2. 21	2, 449	390	368	474	3, 681	235	3. 56
Michigan	630, 060	7, 210	49, 437	------	686, 707	2, 829, 000	4. 12	1, 111	182	151	129	1, 573	171	2. 55
Missouri	2, 619, 691	342, 610	46, 194	------	3, 008, 495	8, 951, 000	2. 98	3, 363	322	417	1, 168	5, 270	174	3. 27
Montana	2, 638, 939	109, 254	49, 567	------	2, 797, 760	6, 883, 000	2. 46	1, 445	296	261	417	2, 419	162	7. 14
New Mexico	2, 622, 492	51, 320	49, 671	94, 440	2, 817, 923	8, 916, 000	3. 16	1, 930	373	357	507	3, 167	251	3. 54
North Carolina	51, 997	1, 485	4, 457	------	57, 939	243, 000	4. 19	65	43	22	25	155	292	1. 28
North Dakota	1, 066, 123	268, 551	35, 570	------	1, 370, 244	2, 378, 000	1. 74	712	70	76	430	1, 288	162	6. 56
Ohio	24, 871, 074	2, 732, 422	268, 992	------	27, 872, 488	54, 759, 000	1. 96	26, 895	3, 495	3, 462	4, 695	38, 547	159	4. 56
Oklahoma	2, 685, 787	90, 198	66, 688	------	2, 842, 673	9, 042, 000	3. 18	2, 898	688	682	1, 132	5, 400	183	2. 88
Pennsylvania, bituminous	128, 338, 782	8, 007, 074	1, 492, 806	15, 202, 976	153, 041, 638	325, 618, 000	2. 13	102, 717	16, 254	16, 988	20, 040	155, 999	224	4. 37
South Dakota	3, 960	10, 468	------	------	14, 428	42, 000	2. 91	52	------	------	------	52	127	2. 19
Tennessee	5, 375, 430	121, 446	76, 218	215, 647	5, 788, 741	10, 975, 000	1. 90	4, 912	1, 014	824	1, 198	7, 948	234	3. 11
Texas	1, 060, 845	12, 651	17, 662	------	1, 091, 158	1, 751, 000	1. 60	1, 107	202	105	236	1, 650	195	3. 39
Utah	4, 079, 347	42, 798	47, 716	203, 932	4, 373, 793	10, 362, 000	2. 37	2, 174	425	344	602	3, 545	186	[1] 6. 65
Virginia	13, 381, 511	121, 937	52, 979	576, 959	14, 133, 386	27, 203, 000	1. 92	7, 008	1, 967	2, 592	2, 197	13, 764	263	3. 91
Washington	2, 410, 723	86, 660	49, 920	39, 265	2, 586, 568	9, 350, 000	3. 61	1, 988	370	502	749	3, 609	198	3. 62
West Virginia	138, 359, 940	3, 590, 765	602, 048	956, 587	143, 509, 340	264, 736, 000	1. 84	64, 389	18, 068	17, 495	18, 774	118, 726	247	4. 90
Wyoming	6, 202, 289	120, 601	189, 398	------	6, 512, 288	17, 827, 000	2. 74	3, 706	693	504	959	5, 862	181	6. 15
Total bituminous	526, 285, 997	23, 601, 587	5, 727, 852	17, 751, 549	573, 366, 985	1, 183, 412, 000	2. 06	370, 292	69, 544	70, 988	82, 823	593, 647	215	4. 50

Pennsylvania anthracite	75,318,820	2,687,411	6,431,221		84,437,452	474,164,000	5.62	81,963	20,000	24,268	39,155	165,386	244	2.09
Grand total	601,604,817	26,288,998	12,159,073	17,751,549	657,804,437	1,657,576,000	2.52	452,255	89,544	95,256	121,978	759,033	221	3.92
1927														
Alabama	18,880,865	652,158	232,843		19,765,866	44,524,000	2.25	16,233	3,383	3,662	4,337	27,615	231	3.10
Alaska	98,042	5,215	1,043		104,300	548,000	5.25	56	10	27	61	154	229	2.96
Arizona		4,583			4,583	6,000	1.31	8				8	156	3.67
Arkansas	1,515,330	15,700	17,804		1,548,834	5,393,000	3.48	2,278	418	347	663	3,706	137	3.05
California, Idaho, Nevada, and Oregon	21,076	4,679	2,086		27,841	85,000	3.05	44	6	18	20	88	208	1.52
Colorado	8,542,965	635,213	226,427	319,470	9,724,075	27,044,000	2.78	7,429	1,352	1,283	1,935	11,999	196	[1] 4.13
Georgia	72,083	552	799	3,278	76,712	233,000	3.04				114	114	250	2.69
Illinois	42,757,667	3,379,701	710,856		46,848,224	101,356,000	2.16	53,798	7,893	8,003	7,276	76,970	114	5.36
Indiana	16,754,142	836,922	344,694		17,935,758	36,381,000	2.03	14,925	2,808	2,594	4,025	24,352	120	6.13
Iowa	2,146,788	746,755	56,079		2,949,622	9,304,000	3.15	6,353	894	838	656	8,741	114	2.96
Kansas	3,028,293	371,473	43,996		3,443,762	9,648,000	2.80	5,054	473	336	1,141	7,004	138	3.57
Kentucky	67,579,996	899,824	487,231	156,947	69,123,998	119,249,000	1.73	39,053	8,271	8,005	9,418	64,747	237	4.50
Maryland	2,693,555	107,315	13,972		2,814,842	5,817,000	2.07	2,254	419	336	450	3,459	220	3.70
Michigan	696,820	6,471	53,472		756,763	3,262,000	4.31	1,085	165	145	117	1,512	188	2.67
Missouri	2,601,107	404,605	58,631		3,064,343	8,698,000	2.84	3,887	381	507	1,457	6,232	151	3.26
Montana	2,963,937	125,175	54,526		3,143,638	7,403,000	2.35	1,366	314	233	368	2,281	197	6.99
New Mexico	2,822,899	49,824	62,816		2,935,539	9,179,000	3.13	2,050	384	410	612	3,456	251	3.38
North Carolina	48,535	4,842			53,377	191,000	3.58	80	21	14	25	140	284	1.34
North Dakota	1,213,171	290,023	24,745		1,527,939	2,604,000	1.70	744	75	56	466	1,341	168	6.78
Ohio	13,144,135	2,439,062	216,500		15,799,697	30,376,000	1.92	24,531	3,290	3,255	4,467	35,543	98	4.52
Oklahoma	3,698,285	66,332	53,437		3,818,054	11,570,000	3.03	3,418	700	493	1,185	5,796	197	3.35
Pennsylvania, bituminous	116,025,187	7,177,039	1,317,478	8,444,935	132,964,639	272,714,000	2.05	101,200	15,878	17,226	19,395	153,699	203	4.26
South Dakota	2,925	9,582			12,507	38,000	3.04	49				49	125	2.04
Tennessee	5,423,133	118,720	55,685	185,829	5,783,367	10,645,000	1.84	4,808	920	811	1,092	7,691	235	3.20
Texas	1,288,209	14,559	23,617		1,326,385	1,998,000	1.51	1,130	157	139	248	1,674	202	3.92
Utah	4,563,803	42,553	32,940	142,184	4,781,480	11,084,000	2.32	1,968	429	326	616	3,339	209	[1] 6.84
Virginia	12,234,331	108,395	50,819	522,497	12,916,042	23,203,000	1.80	6,590	1,915	2,694	2,012	13,211	238	4.11
Washington	2,435,005	106,344	45,760	47,953	2,635,062	9,222,000	3.50	1,967	355	373	712	3,407	210	3.68
West Virginia	140,536,113	3,133,188	556,606	896,540	145,122,447	249,730,000	1.72	66,585	17,385	17,814	18,015	119,799	235	5.15
Wyoming	6,435,044	133,080	185,532		6,753,656	18,152,000	2.69	3,562	720	580	929	5,791	189	6.18
Total bituminous	480,223,441	21,889,884	4,930,394	10,719,633	517,763,352	1,029,657,000	1.99	372,565	69,016	70,525	81,812	593,918	191	4.55
Pennsylvania anthracite	70,495,286	3,046,770	6,553,508		80,095,564	420,942,000	5.26	82,583	18,186	26,428	38,062	165,259	225	2.15
Grand total	550,718,727	24,936,654	11,483,902	10,719,633	597,858,916	1,450,599,000	2.43	455,148	87,202	96,953	119,874	759,177	199	3.96

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[1] Probably too high because of practice, common in some districts, of men going into mines to shoot coal and load mine cars on days when tipples or mines, as a whole, are not in operation.

TABLE 3.—*Production, imports, exports, and consumption of anthracite and bituminous coal, 1917–1927, in net tons*

Calendar year	Production	Imports	Exports to—		Net changes in stocks [1]	Consumption in the United States [2]
			Canada and Mexico	Other countries (sea borne)		
Anthracite:						
1917	99,612,000	13,000	5,917,000	90,000	−450,000	94,068,000
1918	98,826,000	37,000	4,910,000	58,000	+1,120,000	92,775,000
1919	88,092,000	83,000	4,871,000	106,000	+1,680,000	81,518,000
1920	89,598,000	32,000	4,987,000	417,000	−1,560,000	85,786,000
1921	90,473,000	9,000	4,569,000	108,000	+3,855,000	81,950,000
1922	54,683,000	234,000	2,579,000	70,000	−4,530,000	56,798,000
1923	93,339,000	300,000	4,993,000	97,000	+1,635,000	86,914,000
1924	87,927,000	118,000	3,932,000	86,000	+3,310,000	80,717,000
1925	61,817,000	383,000	3,098,000	81,000	−5,040,000	64,061,000
1926	84,437,000	814,000	3,947,000	83,000	+4,000,000	[3] 77,221,000
1927	80,096,000	119,000	3,248,000	78,000	+2,218,000	74,671,000
Bituminous:						
1917	551,791,000	1,448,000	18,324,000	5,506,000	--------------	529,409,000
1918	579,386,000	1,457,000	18,316,000	4,034,000	+27,900,000	530,593,000
1919	465,860,000	1,012,000	12,064,000	8,050,000	−34,900,000	481,658,000
1920	568,667,000	1,245,000	16,458,000	22,059,000	+22,800,000	508,595,000
1921	415,922,000	1,258,000	13,590,000	9,541,000	+2,200,000	391,849,000
1922	422,268,000	5,060,000	10,938,000	1,475,000	−12,000,000	426,915,000
1923	564,565,000	1,882,000	16,960,000	4,494,000	+26,000,000	518,993,000
1924	483,687,000	417,000	12,746,000	4,354,000	−17,000,000	484,004,000
1925	520,053,000	602,000	13,547,000	3,915,000	+4,000,000	499,193,000
1926	573,367,000	486,000	13,762,000	21,510,000	+6,000,000	532,581,000
1927	517,763,000	550,000	14,724,000	3,288,000	+500,000	499,801,000

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[1] Anthracite figures are producers' stocks; bituminous, consumers' stocks. Plus sign denotes coal produced but added to stocks and not consumed; minus sign denotes coal consumed that was withdrawn from stocks carried over from preceding year. Anthracite data from Federal Trade Commission cost reports (Coal, No. 2, p. 27) and hearings before Frelinghuysen coal committee, S. Res. 126, 66th Congress, 1st session (pt. 1, p. 308). These anthracite figures for 1918 represent coal year, since then calendar years, and are in part estimates. Bituminous data from reports on consumers' stocks of bituminous coal, issued by United States Bureau of Mines and article in Coal Age, Aug. 26, 1920, p. 429, by C. E. Lesher, formerly coal statistician, United States Geological Survey, and director of statistical division, United States Fuel Administration.

[2] Production tonnage, plus imports and minus exports, plus or minus the decrease or increase, respectively, of the net change in coal stocks.

[3] Revised figures.

TABLE 4.—*Salient statistics of the bituminous coal industry in 1913 and 1923–1927*

	1913	1923	1924	1925	1926	1927
Production:						
Loaded at mines for shipment...net tons	403, 434, 246	505, 859, 295	441, 565, 694	477, 172, 812	526, 285, 997	480, 223, 441
Sold to local trade and used by employees...do	13, 871, 828	22, 081, 040	21, 111, 004	21, 351, 223	23, 601, 587	21, 889, 884
Used at mines for steam and heat...do	11, 670, 903	8, 765, 011	6, 617, 681	5, 776, 103	5, 727, 852	4, 930, 394
Made into coke at mines...do	49, 458, 320	27, 859, 316	14, 392, 159	15, 752, 603	17, 751, 549	10, 719, 633
Total...do	478, 435, 297	564, 564, 662	483, 686, 538	520, 052, 741	573, 366, 985	517, 763, 352
Value at mines (total)	$565, 235, 000	$1, 514, 621, 000	$1, 062, 626, 000	$1, 060, 402, 000	$1, 183, 412, 000	$1, 029, 657, 000
Average sales realization per ton	$1. 18	$2. 68	$2. 20	$2. 04	$2. 06	$1. 99
Average spot price, as quoted by Coal Age	$1. 23	$2. 77	$2. 08	$2. 06	$2. 21	$1. 99
Number of active mines of commercial size:						
Class 1A (producing 500,000 tons or more)	694	748	129	145	174	132
Class 1B (producing 200,000 to 500,000 tons)			517	569	649	647
Class 2 (producing 100,000 to 200,000 tons)	837	935	819	833	845	818
Class 3 (producing 50,000 to 100,000 tons)	959	1, 176	943	891	867	879
Class 4 (producing 10,000 to 50,000 tons)	1, 558	2, 742	2, 047	1, 969	1, 912	1, 831
Class 5 (producing less than 10,000 tons)	1, 728	3, 730	3, 131	2, 737	2, 730	2, 704
Total	5, 776	9, 331	7, 586	7, 144	7, 177	7, 011
Per cent of output from mines in classes 1A, 1B, and 2	75. 4	70. 4	72. 8	76. 4	79. 1	77. 1
Exports to Canada...net tons	15, 115, 733	16, 854, 257	12, 654, 869	13, 421, 007	13, 633, 513	14, 594, 297
Exports overseas and all other...do	5, 029, 435	4, 599, 322	4, 445, 478	4, 040, 553	21, 638, 424	3, 417, 447
Imports...do	1, 583, 520	1, 882, 306	417, 226	601, 737	485, 666	549, 843
Consumption (calculated)...do	459, 874, 000	518, 993, 000	484, 004, 000	499, 193, 000	532, 581, 000	499, 801, 000
Capacity of mines with existing labor force, assuming 308 working-days a year...net tons	635, 000, 000	970, 000, 000	871, 000, 000	822, 000, 000	821, 000, 000	835, 000, 000
Average number of days worked	232	179	171	195	215	191
Average number of days idle	76	129	137	113	93	117
Average number of men employed at mines in operation:						
Miners, loaders, and shot firers	[1] 494, 238	422, 040	380, 324	367, 456	370, 292	372, 565
Other underground		178, 265	151, 580	139, 085	140, 532	139, 541
Surface	[1] 77, 644	104, 488	87, 700	81, 952	82, 823	81, 812
Total	571, 882	704, 793	619, 604	588, 493	593, 647	593, 918
Output per man per day...net tons	3. 61	4. 47	4. 56	4. 52	4. 50	4. 55
Output per man per year...do	837	801	781	884	966	872
Per cent of output cut by machine	50. 7	66. 9	69. 5	70. 6	71. 7	72. 2
Number of power shovels in strip pits	[2] 48	442	420	389	410	455
Quantity produced by stripping...net tons	[2] 1, 280, 946	11, 844, 347	13, 606, 954	16, 870, 907	16, 922, 695	18, 378, 166

[1] Estimate.

[2] Figures are for 1914, the year of earliest record.

METHODS OF COLLECTING THE STATISTICS

VOLUNTARY COOPERATION

The principal statistics for each State for 1926 and 1927 are given in Table 2. These statistics are obtained from the producers' written reports, most of them signed by officers of the companies that furnish the figures. The reports are collected by correspondence which is supplemented by visits of field agents if correspondence has failed. The Bureau of Mines has no power to compel the filing of reports.

Under this system accurate results can be obtained only by the generous cooperation of the producers in furnishing returns voluntarily. The operators generally respond cordially to the bureau's questionnaires, with which they have become familiar through more than 40 years of contact and cooperation, so that a very large percentage of the returns is obtained by mail, leaving relatively few reports to be obtained by personal visits.

COMPLETENESS OF THE RETURNS

Commercial mines and wagon mines.—A complete count of the thousands of wagon mines and country coal banks from which bituminous coal is dug in the United States could be made only by sending agents up every creek and along every hillside in the coal-bearing regions. The cost of such a count would prohibit it, and in practice a limit must be set to the size of the mines to be considered. The Federal Census Bureau set this limit at mines producing about 1,000 tons a year for the last decennial census of mines and quarries, taken in 1920. Many of the States that publish statistics set the limit higher. The Pennsylvania Department of Mines, for example, covers only enterprises employing as many as 10 men.

The Bureau of Mines desires to ascertain the total output of coal from all sources, large or small, in order to find the rate at which the country's resources are being drawn upon. In practice, however, it has been found advisable to employ different methods for the commercial mines, on the one hand, and the wagon mines, on the other.

The line between commercial mines and small workings, however, is difficult to draw. Mere size of output is not a criterion, for some wagon mines ship rather large quantities of coal. Absence of a railroad switch is not a criterion, for this would exclude from the commercial class some large mines that ship by river or truck or that deliver their product to associated industries at the mouth of the mine.

In practice, the Bureau of Mines has found a safer criterion to be size in conjunction with steady operation. All mines that produce 10,000 tons or more a year are classed by the bureau as commercial mines, but the commercial class also includes much smaller mines, some of which have an annual output of hardly 1,000 tons, but produce year after year and show a fairly continuous existence.

These smaller properties sometimes ship by rail but oftener serve a local market by wagon or truck or supply a local manufacturing plant near the tipple. There are many hundreds of such small operations that continue to contribute to the supply of coal year after year, and the bureau endeavors to include them in its lists of commercial producers. A mine may be shifted from the list of commercial mines to the list of wagon mines, or vice versa, as the course of the work at the mine may make such a shift advisable.

Method of obtaining data on commercial mines.—For the commercial mines statistics can be obtained largely by correspondence. To the mailing list new names are constantly being added from the trade journals, from the records of State mine inspectors, from reports of field agents, and from reports by the producers themselves. At intervals the list is checked against lists kept by associations of operators or State officials and lists of shippers kept by railroad car distributors.

Schedules of inquiry are mailed by the Bureau of Mines to all producing companies listed, and no company is dropped from the list until it has been definitely accounted for. To follow up companies from which no reply is received by correspondence, cooperative arrangements have been made with State geologists and coal-mine inspectors, secretaries of operators' associations, and other local agents, who make inquiry in person and report to Washington. In the Western States the work of following up the returns is aided by the branch offices maintained by the Bureau of Mines at Joplin, Denver, Salt Lake City, and San Francisco. Areas to which no permanent local representative of the bureau has been assigned can be covered only by sending out field agents from Washington, and the present plans include regular work by such agents every year.

Some of the mines are operated so intermittently that the owners can not be found at the end of the year, and recourse must be had to railroads to find the number of tons of coal shipped by these mines, from which estimates can be made of the number of men employed and the value of the product. Such estimates are made in order to round out totals, but only when the evidence shows that a mine was in operation during the year and when all other means of getting the exact figures have failed. Wherever in this report the inclusion of estimates introduces the probability of significant error, that fact is indicated.

Method of obtaining data on wagon mines.—The method just described has yielded satisfactory figures for the operation of mines on the list of commercial producers. To handle the sporadic wagon mines, "fly-by-nights," and "snowbirds" that appear, mushroom-like, at times of shortage and high prices, requires a different method. All these workings are referred to by the bureau as wagon mines, the term in common usage that most nearly describes them. Where these wagon mines are within reach of a railroad and are therefore able to demand railroad cars for shipment of their product, they may have a material influence on the car supply, on the spot price, on the rate of wages, and on the prevailing quality of coal, an influence out of all proportion to the actual tonnages they ship. In 1920, for example, there were more than 4,000 such wagon mines in operation, all demanding railroad cars, and they shipped by rail about 4,500,000 tons of bituminous coal. They are chiefly important in the Appalachians, where coal outcrops abundantly along many of the railroads and surfaced highways. Under such conditions coal can be dug with almost no capital investment. The labor cost at wagon mines is high. Such workings can compete only in periods of high prices but can open or close without thought of fixed charges, depreciation, and maintenance; their only consideration is the price of coal on the spot market.

When coal prices are high the wagon mines are important enough to be included in the statistics, but how to obtain complete information about them is a problem. After experimenting with various methods the bureau has found that the only feasible plan is to ask each railroad for a list of the wagon mines on its lines that shipped coal during the year and for the number of cars shipped by each. Such information was generously furnished by the railroads in 1920, 1922, and 1923 and gave virtually complete information as to the number, location, and output of the wagon mines that shipped by rail in those years.

On the other hand, when the price is low, wagon mines close as suddenly as they open and disappear as a factor in the trade; therefore in 1921, 1924, 1925, 1926, and 1927 no attempt was made to get information on the output of these mines. Statistics for these years relate to the commercial mines exclusively. It is not to be inferred, however, that the figures given are incomplete. A complete count of all the wagon mines shipping by rail would have added only a few thousand tons to the totals in this report.

Data on labor in wagon mines.—No reports on the number of employees or time worked have ever been obtained from the wagon mines, and in this report all the statistics on men employed, days worked, output per man, and the like for the years in which the tonnage of wagon mines was covered are calculated from the returns of the commercial mines alone.

Omission of country coal banks.—The methods outlined above are believed to yield virtually complete returns for all mines, big and little, that ship by rail or water and for all those of commercial size that serve a purely local market. The data herein do not cover the tiny workings that produce less than 1,000 tons a year and are situated at points remote from a railroad—workings that can best be described as country coal banks. Little openings of this kind, where one or two men dig a few hundred bushels for sale in the neighborhood or farmers come with their wagons and trucks to dig their own fuel, are common in regions where coal outcrops. Although their number runs into the thousands, their combined output is so small as to be negligible; their product does not involve the use of railroad cars and does not compete with the output of commercial mines. When in the past the attempt was made to obtain data on these coal banks regularly, the maximum total output reported for them was about 1,000,000 tons a year, a quantity too small to justify the cost of collecting the information.

UNITS OF MEASUREMENT

The standard unit of measurement adopted for this report is the net or short ton of 2,000 pounds, but as Pennsylvania anthracite is mined and sold by the gross or long ton of 2,240 pounds that unit is used in the section of the report dealing with anthracite. Unless the unit is otherwise expressly stated, the word "ton" as here used means the net ton of 2,000 pounds, to which all other figures, however reported, have been converted.

There is a steadily growing sentiment in favor of the general use of the net ton of 2,000 pounds as the standard unit of the coal trade, particularly for bituminous coal in the Eastern States, where both gross and net tons are now used. The use of both units is, of course, undesirable, but as some State and municipal laws require the use of the gross ton and as freight rates throughout a part of the Eastern States are now fixed accordingly, it is difficult to make an immediate change to a standard unit. In reports on foreign trade and shipping rates quantities are expressed in either gross or metric tons, and here, too, the use of more than one unit is undesirable. The general use of the net ton in the United States, even in the anthracite region, is here recommended.

LIGNITE AND BITUMINOUS COAL

The statistics of the bituminous coal industry published in this report include lignite. In the classification of coals adopted by the United States Geological Survey the "black lignites" mined in the far West are termed "subbituminous coals." True lignite, although occurring in enormous amounts in the northern Great Plains and Gulf coast geological provinces, is as yet little mined in the United States. The production in 1927 was about 2,767,000 tons, of which 1,528,000 was mined in North Dakota, 12,000 in South Dakota, 58,000 in eastern Montana, and 1,169,000 in the lignite area of Texas. Although the producers of this coal have certain problems in common, they do not form a separate national interest, as do the producers in the brown-coal industry of Germany. Their system of mining resembles that used by the producers of bituminous coal. Some day, when lignite rises to a commanding place in the fuel supply of the country, there will be need of showing it separately in the statistics of production; at present statistics thereon can best be combined with those for the bituminous coal industry.

GENERAL STATISTICS

GROWTH OF THE INDUSTRY

TABLE 5.—*Growth of the bituminous coal-mining industry, 1890–1927*

Year	Production (millions of net tons)	Value (millions of dollars)	Men employed (thousands)	Calculated capacity (millions of net tons)		Average number of days worked	Average number of days lost on account of—			Value per ton	Net tons per man		Per cent mined by machine	Mined by stripping (millions of net tons)[1]
				At 308 days	At 280 days		Strikes	Other causes	Total lost		Per day	Per year		
1890	111	110	192	152	137	226	(2)	(2)	82	$0.99	2.56	579	(2)	(2)
1891	118	117	206	163	148	223	(2)	(2)	85	.99	2.57	573	5.3	(2)
1892	127	125	213	178	162	219	(2)	(2)	89	.99	2.72	596	(2)	(2)
1893	128	123	230	194	174	204	(2)	(2)	104	.96	2.73	557	(2)	(2)
1894	119	108	245	214	196	171	(2)	(2)	137	.91	2.84	486	(2)	(2)
1895	135	116	240	215	196	194	(2)	(2)	114	.86	2.90	563	(2)	(2)
1896	138	115	244	221	202	192	(2)	(2)	116	.83	2.94	564	11.9	(2)
1897	148	120	248	232	213	196	(2)	(2)	112	.81	3.04	596	15.3	(2)
1898	167	133	256	243	221	211	(2)	(2)	97	.80	3.09	651	19.5	(2)
1899	193	168	271	254	230	234	8	66	74	.87	3.05	713	22.7	(2)
1900	212	221	304	279	255	234	5	69	74	1.04	2.98	697	24.9	(2)
1901	226	236	340	309	281	225	2	81	83	1.05	2.94	664	25.6	(2)
1902	260	291	370	348	316	230	7	71	78	1.12	3.06	703	26.8	(2)
1903	283	352	416	387	350	225	3	80	83	1.24	3.02	680	27.6	(2)
1904	279	306	438	425	386	202	8	98	106	1.10	3.15	637	28.2	(2)
1905	315	335	461	460	417	211	2	95	97	1.06	3.24	684	32.8	(2)
1906	343	381	478	496	451	213	28	67	95	1.11	3.36	717	34.7	(2)
1907	395	451	513	520	473	234	1	73	74	1.14	3.29	769	35.1	(2)
1908	333	374	516	531	482	193	11	104	115	1.12	3.34	644	37.0	(2)
1909	380	405	543	560	510	209	1	98	99	1.07	(2)	(2)	37.5	(2)
1910	417	469	556	592	538	217	35	56	91	1.12	3.46	751	41.7	(2)
1911	406	451	550	593	538	211	2	95	97	1.11	3.50	738	43.9	(2)
1912	450	518	549	622	566	223	10	75	85	1.15	3.68	820	46.8	(2)
1913	478	565	572	635	577	232	5	71	76	1.18	3.61	837	50.7	(2)
1914	423	493	584	668	608	195	19	94	113	1.17	3.71	724	51.7	1.3
1915	443	502	557	672	610	203	4	101	105	1.13	3.91	794	55.0	2.8
1916	503	665	561	673	613	230	4	74	78	1.32	3.90	896	56.5	3.9
1917	552	1,249	603	699	636	243	4	61	65	2.26	3.77	915	55.5	5.8
1918	579	1,492	615	717	650	249	1	58	59	2.58	3.78	942	55.9	8.3
1919	466	1,161	622	736	669	195	25	88	113	2.49	3.84	749	59.2	5.6
1920	569	2,130	640	796	725	220	6	82	88	3.75	4.00	881	59.8	8.9
1921	416	1,200	664	860	781	149	3	156	159	2.89	4.20	627	65.6	4.7
1922	422	1,275	688	916	832	142	78	88	166	3.02	4.28	609	63.2	9.9
1923	565	1,515	705	970	885	179	2	127	129	2.68	4.47	801	66.9	11.8
1924	484	1,063	620	871	792	171	7	130	137	2.20	4.56	781	69.5	13.6
1925	520	1,060	588	822	748	195	2	111	113	2.04	4.52	884	70.6	16.9
1926	573	1,183	594	821	747	215	1	92	93	2.06	4.50	966	71.7	16.9
1927	518	1,030	594	835	759	191	45	72	117	1.99	4.55	872	72.2	18.4

[1] See footnote 1, Table 34.

[2] No data.

TABLE 6.—*Growth of the anthracite-mining industry, 1890–1927*

Year	Production (millions of gross tons)	Value (millions of dollars)	Employees (thousands)	Calculated capacity at 304 days (millions of gross tons)	Average number of days worked	Net tons per man		Washery and dredge shipments (millions of gross tons)	Per cent of shipments that were domestic sizes (excluding pea) [1]	Per cent of total shipments that came from [2]—		
						Per day	Per year			Lehigh region	Schuylkill region	Wyoming region
1890	41	66	126	63	200	1.85	369	(3)	76.9	17.3	29.7	53.0
1891	45	74	126	68	203	1.98	401	0.1	75.7	15.8	31.5	52.7
1892	47	82	129	72	198	2.06	407	.1	76.0	15.4	30.1	54.5
1893	48	86	133	74	197	2.06	406	.2	74.9	16.0	28.7	55.3
1894	46	78	132	74	190	2.08	395	.6	73.7	16.2	29.1	54.7
1895	52	82	143	80	196	2.07	406	1.1	69.9	15.7	30.7	53.6
1896	49	82	149	85	174	2.10	365	.9	70.3	15.0	30.4	54.6
1897	47	79	150	95	150	2.34	351	1.0	68.5	15.0	29.3	55.7
1898	48	75	146	95	152	2.41	367	1.1	67.3	14.9	28.8	56.3
1899	54	88	140	95	173	2.50	433	1.4	66.1	14.4	29.8	55.8
1900	51	86	144	94	166	2.40	398	2.1	64.7	15.3	30.0	54.7
1901	60	113	145	93	196	2.37	464	2.6	64.2	13.5	29.9	56.6
1902	37	76	148	97	116	2.40	279	2.0	61.0	11.1	27.2	61.7
1903	67	152	150	98	206	2.41	496	3.6	63.6	12.1	27.7	60.2
1904	65	139	156	99	200	2.35	469	2.8	62.0	12.4	28.5	59.1
1905	69	142	165	98	215	2.18	470	2.6	60.9	12.8	28.8	58.4
1906	64	132	162	99	195	2.25	439	3.8	59.1	12.6	28.8	58.6
1907	76	164	167	106	220	2.33	512	4.3	58.6	12.4	30.0	57.6
1908	74	158	174	113	200	2.39	478	3.6	59.3	12.0	27.9	60.1
1909	72	149	(4)	107	205	(4)	(4)	3.7	58.3	12.2	27.2	60.6
1910	75	161	169	100	229	2.17	498	3.3	58.6	13.3	27.5	59.2
1911	81	175	173	100	246	2.13	524	3.2	59.4	13.9	27.4	58.7
1912	75	178	174	99	231	2.10	485	3.2	60.8	13.6	28.2	58.2
1913	82	195	176	97	257	2.02	520	2.1	61.7	14.4	27.4	58.2
1914	81	188	180	101	245	2.06	505	1.7	61.4	14.7	26.3	59.0
1915	79	185	177	105	230	2.19	504	2.5	60.1	14.9	26.5	58.6
1916	78	202	160	94	253	2.16	548	3.1	60.5	14.1	29.3	56.6
1917	[5] 89	284	154	95	285	[5] 2.27	[5] 646	5.4	61.0	14.9	28.6	56.5
1918	[5] 88	336	147	92	293	[5] 2.29	[5] 672	6.6	60.1	15.1	28.9	56.0
1919	79	365	155	90	266	2.14	570	3.3	64.2	15.5	28.5	56.0
1920	[5] 80	434	145	90	271	[5] 2.28	[5] 618	5.0	63.1	14.6	30.4	55.0
1921	81	452	160	91	271	2.09	567	1.6	66.5	13.5	28.9	57.6
1922	[5] 49	274	157	98	151	[5] 2.31	[5] 349	3.2	62.9	13.9	31.8	54.3
1923	83	507	158	95	268	2.21	592	4.1	63.7	13.9	30.4	55.7
1924	79	477	160	87	274	2.00	550	1.4	65.3	13.5	28.5	58.0
1925	55	328	160	92	182	2.12	386	1.4	66.4	14.0	29.1	56.9
1926	75	474	165	94	244	2.09	511	1.4	66.7	14.0	28.3	57.7
1927	72	421	165	96	225	2.15	485	1.8	63.3	14.0	30.0	56.0

[1] Excludes Sullivan County and dredge coal.

[2] Includes dredge shipments, 1914–1927.

[3] Less than one-tenth million tons.

[4] No data.

[5] Years of heavy washery output.

RELATIVE RATE OF GROWTH OF COAL AND OTHER SOURCES OF POWER

Although coal production in 1927 was below the war-time maximum, the production of oil, natural gas, and water power has enormously increased since the war. Tables 7 to 9 bring out the difference in relative growth of the principal sources of energy.

In order to compare the several sources it is necessary to reduce them to a common denominator. This is done in Table 7, which shows the energy equivalent in British thermal units of each of the fuels. The figures for oil represent not merely fuel oil but the total production of crude petroleum, including that refined into gasoline and other products. To complete the picture the energy in imported crude is also shown, because for several years the imports were an important element in the total supply of energy. Water power is represented by the equivalent of the fuel necessary to perform the same work. The total of the energy from all sources is given in the last column of the table. For 1927 it amounts to 24,741 trillion B. t. u. and ranks second only to 1926 as the greatest in the history of the country. Thus while the consumption of coal has not advanced since the war, the total consumption of energy has increased.

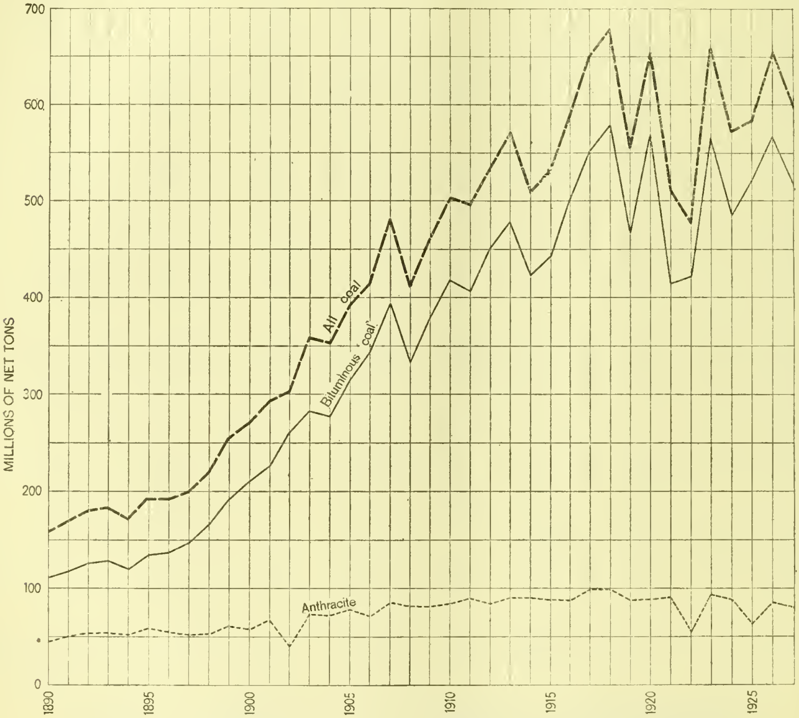

FIGURE 5.—Production of anthracite, bituminous coal, and all coal, 1890–1927

To make comparisons easier the figures of heat units are reduced to index numbers, taking the year 1918 as 100, and are shown in Table 8. Table 9 shows the percentage of the total energy of the fuels which was contributed by each of the primary sources.

The competitive relations of the several sources are further discussed on pages 405 and 412 to 414.

TABLE 7.—*Annual supply of energy from mineral fuels and water power in the United States, 1819–1927*

[Figures represent trillions of British thermal units and because of rounding do not always add across exactly. Water power is represented by British thermal units of coal necessary to produce the same amount of power. Figures represent production except those for oil imports, and take no account of changes of stock]

Year	Anthracite	Bituminous coal	Total coal	Domestic oil	Natural gas	Imported oil	Total oil and gas	Total mineral fuels	Water power	Grand total, including water power
1819	(2)	--------	(2)	--------	--------	--------	--------	(2)	(1)	(1)
1829	4	3	6	--------	--------	--------	--------	6	(1)	(1)
1839	27	41	68	--------	--------	--------	--------	68	(1)	(1)
1849	109	64	173	--------	--------	--------	--------	173	(1)	(1)
1859	262	158	419	(2)	--------	--------	--------	419	(1)	(1)
1869	464	415	879	25	--------	--------	25	904	(1)	(1)
1879	822	993	1,815	119	(2)	--------	119	1,934	(1)	(1)
1889	1,239	2,507	3,746	211	[3] 268	--------	479	4,225	91	4,316
1899	1,643	5,065	6,708	342	[3] 240	--------	582	7,291	135	7,426
1909	2,205	9,949	12,155	1,099	517	(4)	1,616	13,771	411	14,182
1913	2,490	12,535	15,025	1,491	626	102	2,219	17,243	588	17,831
1918	2,688	15,180	17,868	2,136	775	226	3,137	21,005	837	21,842
1919	2,396	12,206	14,602	2,270	802	317	3,389	17,991	892	18.883
1920	2,437	14,899	17,336	2,658	858	637	4,153	21,489	971	22,460
1921	2,461	10,897	13,358	2,833	712	752	4,297	17,655	908	18,563
1922	1,487	11,063	12,551	3,345	820	764	4,929	17,480	1,024	18,504
1923	2,539	14,791	17,330	4,394	1,082	492	5,968	23,298	1,136	24,434
1924	2,392	12,672	15,064	4,284	1,227	467	5,978	21,042	1,167	22,209
1925	1,681	13,625	15,306	4,582	1,278	371	6,231	21,537	1,290	22,827
1926	2,297	15,022	17,319	4,625	1,411	362	6,398	23,717	1,492	25,209
1927	2,179	13,565	15,744	5,407	1,553	350	7,310	23,054	1,687	24,741

[1] No figures for water power are available before 1889. The fuel equivalent for water power is calculated from the reported horsepower of installed water wheels, assuming a capacity factor of 20 per cent for manufactures and mines and of 40 per cent for public utilities, and assuming that the theoretical thermal equivalent of 1 horsepower-hour (2,547 British thermal units) is 7 per cent of the British thermal units that would have been consumed in generating 1 horsepower-hour from fuels in practice. For 1919 to 1927, however, actual reports of the horsepower-hours produced by water in electric utility plants, as recorded by the U. S. Geological Survey, have been used.

[2] Less than 0.5.

[3] Based on the amount of coal displaced by gas, as estimated by the gas companies at the time.

[4] Imports negligible before 1913.

TABLE 8.—*Relative rates of growth of coal, oil, and water power in the United States, 1819–1927*

[The figures for 1918 are represented by the number 100, and the figures for all other years are expressed as a percentage of the 1918 rate]

Year	Anthracite	Bituminous coal	Total coal	Domestic oil	Natural gas	Imported oil	Total oil and gas	Total mineral fuels	Water power	Grand total, including water power
1819	(1)	--------	(1)	--------	--------	--------	--------	(1)	(2)	(2)
1829	(1)	(1)	(1)	--------	--------	--------	--------	(1)	(2)	(2)
1839	1	(1)	(1)	--------	--------	--------	--------	(1)	(2)	(2)
1849	4	(1)	1	--------	--------	--------	--------	1	(2)	(2)
1859	10	1	2	(1)	--------	--------	(1)	2	(2)	(2)
1869	17	3	5	1	--------	--------	1	4	(2)	(2)
1879	31	6	10	6	(1)	--------	4	9	(2)	(2)
1889	46	17	21	10	35	--------	15	20	11	20
1899	61	33	37	16	31	--------	19	35	16	34
1909	82	66	68	51	67	(3)	52	66	49	65
1913	93	83	84	70	81	45	71	82	70	82
1918	100	100	100	100	100	100	100	100	100	100
1919	89	80	81	106	103	140	108	86	107	86
1920	91	98	97	124	111	282	132	102	116	103
1921	92	72	74	132	92	333	137	84	109	85
1922	55	73	70	156	106	338	157	83	122	85
1923	94	97	97	206	140	218	191	111	136	112
1924	89	83	84	201	158	207	191	100	139	102
1925	63	90	86	215	165	164	199	103	154	105
1926	85	99	97	217	182	160	204	113	178	115
1927	81	89	88	253	201	155	233	110	202	113

[1] Less than 0.5. [2] No data for water power prior to 1889. [3] Imports negligible prior to 1913.

TABLE 9.—*Per cent of total heating value contributed by the several mineral fuels in the United States, 1819–1927*

Year	Anthracite	Bituminous coal	Total coal	Domestic oil	Natural gas	Imported oil	Total oil and gas	Grand total fuels	Water power, per cent of fuels[1]
1819	100.0	--------	100.0	--------	--------	--------	--------	100.0	(1)
1829	58.4	41.6	100.0	--------	--------	--------	--------	100.0	(1)
1839	40.2	59.8	100.0	--------	--------	--------	--------	100.0	(1)
1849	62.8	37.2	100.0	--------	--------	--------	--------	100.0	(1)
1859	62.3	37.7	100.0	(2)	--------	--------	--------	100.0	(1)
1869	51.3	45.9	97.2	2.8	(2)	--------	2.8	100.0	(1)
1879	42.5	51.3	93.8	6.2	(2)	--------	6.2	100.0	(1)
1889	29.3	59.3	88.6	5.0	[3] 6.4	--------	11.4	100.0	2.2
1899	22.5	69.5	92.0	4.7	[3] 3.3	--------	8.0	100.0	1.9
1909	16.0	72.2	88.2	8.0	3.8	(2)	11.8	100.0	3.0
1913	14.4	72.7	87.1	8.7	3.6	0.6	12.9	100.0	3.4
1918	12.8	72.3	85.1	10.1	3.7	1.1	14.9	100.0	4.0
1919	13.3	67.9	81.2	12.6	4.5	1.7	18.8	100.0	5.0
1920	11.4	69.3	80.7	12.4	4.0	2.9	19.3	100.0	5.0
1921	14.0	61.7	75.7	16.0	4.0	4.3	24.3	100.0	5.1
1922	8.5	63.3	71.8	19.1	4.7	4.4	28.2	100.0	5.9
1923	10.9	63.5	74.4	18.9	4.6	2.1	25.6	100.0	4.9
1924	11.4	60.2	71.6	20.4	5.8	2.2	28.4	100.0	5.5
1925	7.8	63.3	71.1	21.3	5.9	1.7	28.9	100.0	6.0
1926	9.7	63.3	73.0	19.5	6.0	1.5	27.0	100.0	6.3
1927	9.5	58.8	68.3	23.5	6.7	1.5	31.7	100.0	7.3

[1] No figures for water power are available before 1889; hence to make the figures comparable the data for water power thereafter are expressed as per cent of the fuel total but are not included in the base on which the percentages are computed.
[2] Less than 0.1 per cent.
[3] Figures from 1869 to 1899 based on estimated quantity of coal displaced.

PRODUCTION SUMMARIES, BY STATES

TABLE 10.—*Comparison of bituminous coal produced, by States, 1913, 1923, 1926, and 1927*

State	Production (net tons)				Per cent of increase or decrease		
	1913	1923	1926	1927	1913–1927	1923–1927	1926–1927
Alabama	17,678,522	20,457,649	21,000,962	19,765,866	+11.8	−3.4	−5.9
Arkansas	2,234,107	1,296,892	1,459,017	1,548,834	−30.7	+19.4	+6.2
Colorado	9,232,510	10,346,218	10,637,225	9,724,075	+5.3	−6.0	−8.6
Georgia	255,626	75,620	59,869	76,712	−70.0	+1.4	+28.1
Illinois	61,618,744	79,310,075	69,366,923	46,848,224	−24.0	−40.9	−32.5
Indiana	17,165,671	26,229,099	23,186,006	17,935,758	+4.5	−31.6	−22.6
Iowa	7,525,936	5,710,735	4,625,487	2,949,622	−60.8	−48.3	−36.2
Kansas	7,202,210	4,443,149	4,416,480	3,443,762	−52.2	−22.5	−22.0
Kentucky	19,616,600	44,777,317	62,924,462	69,123,998	+252.4	+54.4	+9.9
Maryland	4,779,839	2,285,926	3,078,353	2,814,842	−41.1	+23.1	−8.6
Michigan	1,231,786	1,172,075	686,707	756,763	−38.6	−35.4	+10.2
Missouri	4,318,125	3,403,151	3,008,495	3,064,343	−29.0	−10.0	+1.9
Montana	3,240,973	3,147,678	2,797,760	3,143,638	−3.0	−.1	+12.4
New Mexico	3,708,806	2,915,173	2,817,923	2,935,539	−20.8	+.7	+4.2
North Dakota	495,320	1,385,400	1,370,244	1,527,939	+208.5	+10.3	+11.5
Ohio	36,200,527	40,546,443	27,872,488	15,799,697	−56.4	−61.0	−43.3
Oklahoma	4,165,770	2,885,038	2,842,673	3,818,054	−8.3	+32.3	+34.3
Pennsylvania	173,781,217	171,879,913	153,041,638	132,964,639	−23.5	−22.6	−13.1
South Dakota	10,540	10,379	14,428	12,507	+18.7	+20.5	−13.3
Tennessee	6,860,184	6,040,268	5,788,741	5,783,367	−15.7	−4.3	−.1
Texas	2,429,144	1,187,329	1,091,158	1,326,385	−45.4	+11.7	+21.6
Utah	3,254,828	4,720,217	4,373,793	4,781,480	+46.9	+1.3	+9.3
Virginia	8,828,068	11,761,643	14,133,386	12,916,042	+46.3	+9.8	−8.6
Washington	3,877,891	2,926,392	2,586,568	2,635,062	−32.0	−10.0	+1.9
West Virginia	71,254,136	107,899,941	143,509,340	145,122,447	+103.7	+34.5	+1.1
Wyoming	7,393,066	7,575,031	6,512,288	6,753,656	−8.6	−10.8	+3.7
Other States	75,151	175,911	164,571	190,101	+153.0	+8.1	+15.5
	478,435,297	564,564,662	573,366,985	517,763,352	+8.2	−8.3	−9.7

TABLE 11.—*Coal produced in 1927, by States, and highest recorded production*

State	1927 (net tons)	Maximum production	
		Year	Net tons
Alabama	19, 765, 866	1926	21, 000, 962
Alaska	104, 300	1923	119, 826
Arkansas	1, 548, 834	1907	2, 670, 438
California, Idaho, and Oregon	[1] 32, 424	1880	280, 155
Colorado	9, 724, 075	1917	12, 483, 336
Georgia	76, 712	1903	416, 951
Illinois	46, 848, 224	1918	89, 291, 105
Indiana	17, 935, 758	1918	30, 678, 634
Iowa	2, 949, 622	1917	8, 965, 830
Kansas	3, 443, 762	1918	7, 561, 947
Kentucky	69, 123, 998	1927	69, 123, 998
Maryland	2, 814, 842	1907	5, 532, 628
Michigan	756, 763	1907	2, 035, 858
Missouri	3, 064, 343	1917	5, 670, 549
Montana	3, 143, 638	1918	4, 532, 505
New Mexico	2, 935, 539	1918	4, 023, 239
North Carolina	53, 377	1922	78, 570
North Dakota	1, 527, 939	1927	1, 527, 939
Ohio	15, 799, 697	1920	45, 878, 191
Oklahoma	3, 818, 054	1920	4, 849, 288
Pennsylvania, bituminous	132, 964, 639	1918	178, 550, 741
South Dakota	12, 507	1925	14, 447
Tennessee	5, 783, 367	1910	7, 121, 380
Texas	1, 326, 385	1913	2, 429, 144
Utah	4, 781, 480	1920	6, 005, 199
Virginia	12, 916, 042	1926	14, 133, 386
Washington	2, 635, 062	1918	4, 082, 212
West Virginia	145, 122, 447	1927	145, 122, 447
Wyoming	6, 753, 656	1920	9, 630, 271
Pennsylvania, anthracite	80, 095, 564	1917	99, 611, 811

[1] Includes also Arizona and Nevada.

PRODUCTION, BY FIELDS

Many requests are received for information on production by trade fields as distinct from States and counties. In Table 12 the operators' reports to the Bureau of Mines have been retabulated according to the 92 fields into which the United States Coal Commission grouped the bituminous coal mines. Corresponding figures for 1920 and 1921 will be found in Coal in 1923, pages 534 and 535; for 1922 and 1924 in Coal in 1924, pages 471 and 472; for 1925 in Coal in 1925, pages 417 and 418; and for 1926 in Coal in 1926, pages 460 and 461.[7]

The commission's grouping of the fields was made under the direction of C. E. Lesher and R. A. Walter, primarily with a view to its studies of cost of production. The fields are accurately delimited by metes and bounds on pages 2034 and 2052 of the commission's report. Because all the fields adopted did not coincide with generally accepted trade districts they were designated by number rather than by name. For the convenience of the reader of Table 12, however, the trade name most nearly corresponding to the boundaries established by the commission is also listed.

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[7] Data on production by fields in 1917 and 1918 are given in Coal in 1918, Pt. A, p. 705. The grouping of the fields there used is the one adopted for administrative purposes by the United States Fuel Administration and is explained on p. 114 of Pt. I of the Report of the Distribution Division of the Fuel Administration. This grouping differs from that of the United States Coal Commission.

TABLE 12.—*Bituminous coal produced and number of mines active in the several fields adopted by the United States Coal Commission, 1923 and 1927*

[The definitions of these fields are given in detail on pp. 2034–2052, Pt. IV, of the Report of the U. S. Coal Commission]

Coal Commission field No.	State	General name of field	1923		1927	
			Number of mines	Production (net tons)	Number of mines	Production (net tons)
1	Pennsylvania	Pittsburgh	452	42, 209, 000	275	23, 046, 000
2	do	Connellsville	312	37, 882, 000	182	36, 483, 000
3	do	Westmoreland-Ligonier	171	14, 563, 000	104	13, 762, 000
4a, b	do	Freeport (thick and thin)	123	12, 338, 000	96	6, 602, 000
5	do	Butler-Mercer	110	2, 587, 000	77	2, 569, 000
6	do	Blossburg	20	496, 000	12	196, 000
7	do	Broad Top	63	1, 430, 000	43	944, 000
8	do	Somerset	232	5, 772, 000	143	7, 158, 000
9a	do	Central Pennsylvania, western.	1, 385	54, 364, 000	99	3, 548, 000
9b	do	Central Pennsylvania, middle.			172	9, 351, 000
9c	do	Central Pennsylvania, eastern.			627	29, 306, 000
10	Maryland-West Virginia	Maryland-Potomac	159	3, 890, 000	119	4, 612, 000
11	West Virginia	Fairmont	309	22, 883, 000	204	27, 062, 000
12	Ohio-West Virginia	Panhandle-Pittsburgh No. 8.	233	25, 529, 000	190	14, 799, 000
13	do	Pomeroy	41	1, 309, 000	31	1, 142, 000
14	West Virginia	Putnam County	10	345, 000	3	413, 000
15	Kentucky-West Virginia	Kenova	38	2, 103, 000	27	3, 606, 000
16	do	Thacker	89	6, 149, 000	62	8, 407, 000
17	West Virginia	Tug River	87	4, 555, 000	66	7, 856, 000
18	Virginia-West Virginia	Pocahontas	107	16, 481, 000	86	18, 931, 000
19	West Virginia	Winding Gulf	78	7, 228, 000	68	11, 289, 000
20	do	New River	145	8, 810, 000	118	13, 114, 000
21	do	Kanawha	285	12, 741, 000	170	18, 654, 000
22	do	Coal River	29	1, 397, 000	20	2, 674, 000
23	do	Logan	155	12, 831, 000	97	21, 510, 000
24a	do	Coal and Coke	39	1, 158, 000	12	1, 026, 000
24b	do	Preston County	58	1, 937, 000	39	1, 687, 000
24c	do	Taylor County, Junior, Philippi, and Gauley.	176	6, 140, 000	120	6, 718, 000
25	Virginia	Southwestern Virginia	123	8, 148, 000	69	9, 070, 000
26	do	Clinch Valley	34	2, 464, 000	21	2, 358, 000
27	do	Upper New River	[1] 8	[1] 217, 000	7	159, 000
28	do	Richmond Basin	(1)	(1)	-------	------------
29	Ohio	Massillon-Palmyra-Lisbon	90	2, 815, 000	86	1, 507, 000
30	do	Coshocton-Goshen	155	3, 174, 000	117	1, 602, 000
31	do	Cambridge	55	4, 780, 000	46	1, 029, 000
32	do	Crooksville	60	1, 015, 000	36	394, 000
33	do	Hocking	241	7, 517, 000	114	2, 152, 000
34	do	Jackson and Ironton	89	610, 000	44	366, 000
36	Kentucky	Northeast Kentucky	225	9, 602, 000	171	14, 675, 000
37	do	Hazard	128	6, 660, 000	87	8, 521, 000
38	do	Harlan	75	8, 752, 000	69	13, 744, 000
39	Kentucky-Tennessee	Southern Appalachian	221	6, 765, 000	125	7, 511, 000
40	do	Jellico	55	1, 003, 000	28	854, 000
41	Kentucky	Western Kentucky	172	10, 890, 000	162	21, 205, 000
42	Tennessee	Rockwood-Soddy	89	2, 563, 000	38	2, 096, 000
43	do	Fentress	13	541, 000	7	817, 000
44	Alabama	Big Seam Group	45	5, 954, 000	48	6, 329, 000
45	Alabama-Georgia	Cahaba Group	109	5, 846, 000	94	5, 501, 000
46	Alabama	Pratt Group	137	8, 696, 000	90	8, 013, 000
47	Indiana	Indiana	272	25, 793, 000	189	17, 641, 000
48	do	Brazil Block	29	345, 000	18	295, 000
49	Illinois	Northern Illinois	60	2, 334, 000	47	1, 023, 000
50	do	Fulton-Peoria	119	4, 190, 000	157	3, 180, 000
51	do	Danville	32	4, 178, 000	34	2, 751, 000
52	do	Central Illinois	108	25, 205, 000	82	12, 255, 000
53	do	Belleville	106	10, 193, 000	92	6, 213, 000
54	do	Murphysboro	10	557, 000	10	382, 000
55	do	Southern Illinois	140	32, 595, 000	123	21, 044, 000
56	Michigan	Michigan	13	1, 172, 000	8	757, 000
57	Arkansas	Sebastian	54	899, 000	40	1, 089, 000
58	do	Excelsior-Logan	22	112, 000	24	213, 000
59	do	Arkansas "anthracite"	18	222, 000	19	247, 000
60	Colorado	Colorado (domestic)	145	4, 430, 000	153	4, 172, 000
61	do	Trinidad	44	3, 182, 000	37	3, 184, 000
62	do	Northern Colorado	47	2, 715, 000	39	2, 368, 000
63	Iowa	Marion-Monroe-Polk	89	4, 485, 000	117	2, 326, 000
64	do	Appanoose	62	1, 217, 000	66	624, 000

[1] Upper New River field includes Richmond Basin field (No. 28).

TABLE 12.—*Bituminous coal produced and number of mines active in the several fields adopted by the United States Coal Commission, 1923 and 1927*—Contd.

Coal Commission field No.	State	General name of field	1923		1927	
			Number of mines	Production (net tons)	Number of mines	Production (net tons)
65	Kansas	Pittsburg	192	4,135,000	199	3,213,000
66	do	Lightning Creek				
67	do	Osage	27	115,000	34	128,000
68	do	Leavenworth [2]	4	137,000	3	121,000
69	Missouri	Southern Missouri [3]	79	2,114,000	125	2,297,000
70	do	Lafayette	69	1,141,000	97	749,000
71	do	Grundy	(3)	(3)	(3)	(3)
72	do	Platte	(2)	(2)	(2)	(2)
73	Montana	Montana	48	3,144,000	60	3,144,000
74	New Mexico	Gallup	13	939,000	15	1,007,000
75	do	Anthracite	11	248,000	8	277,000
76	do	Raton	15	1,678,000	11	1,634,000
76a	do	Monero	3	33,000	3	17,000
77	North Dakota	Southern North Dakota	72	910,000	99	1,002,000
78	do	Northern North Dakota	50	447,000	54	526,000
79	Oklahoma	McAlester Vein	25	640,000	23	577,000
80	do	Oklahoma, eastern	90	2,200,000	86	3,241,000
81	Texas	Texas (bituminous)	10	175,000	4	157,000
82	do	Texas (lignite)	34	1,012,000	25	1,169,000
83	Utah	Utah	37	4,720,000	36	4,781,000
84	Washington	Kittitas County	12	1,358,000	11	1,198,000
85	do	Pierce-King (bituminous)	16	605,000	22	1,022,000
86	do	Lewis	28	963,000	21	415,000
87	Wyoming	Wyoming	62	7,559,000	62	6,754,000
88	South Dakota	South Dakota	15	10,000	19	12,000
89	Oregon	Oregon	(4)	(4)	(4)	(4)
90	California [4]	California [4]	5	20,000	4	28,000
91	Nevada	Nevada			(4)	(4)
92	North Carolina	North Carolina	2	36,000	2	53,000
	Unclassified		12	120,000	12	109,000
			9,331	563,422,000	7,011	517,763,000

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[2] Leavenworth field, Kansas, includes Platte field, Missouri (No. 72).

[3] Southern Missouri field includes Grundy field (No. 71).

[4] California includes Idaho and Oregon in 1923 and Idaho, Nevada, and Oregon in 1927.

PRODUCTION, BY GEOLOGIC PROVINCES

TABLE 13.—*Production of bituminous coal and lignite, by geologic provinces, in 1913 and 1915–1927, in net tons*

[The production statistics compiled by the Bureau of Mines are usually arranged by States and counties in alphabetical order. In the following table they are regrouped to accord roughly with broad geologic provinces. This grouping will be found useful in studying the degree of exhaustion of the resources and the competitive position of the several fields because the natural conditions that largely control the cost of mining are closely related to the geology]

Province	1913	1915	1916	1917	1918	1919	1920
Northern and Middle Appalachians (Pennsylvania, Ohio, Maryland, West Virginia, Eastern Kentucky, Virginia, and Tennessee)	312, 863, 044	289, 427, 149	329, 396, 180	338, 259, 270	356, 731, 603	304, 636, 935	353, 217, 522
Southern Appalachians (Alabama)	17, 678, 522	14, 927, 937	18, 086, 197	20, 068, 074	19, 184, 962	15, 536, 721	16, 294, 099
Northern Interior (Michigan)	1, 231, 786	1, 156, 138	1, 180, 360	1, 374, 805	1, 464, 818	996, 545	1, 489, 765
Eastern Interior (Illinois, Indiana, and Western Kentucky)	87, 241, 942	83, 377, 584	94, 075, 420	122, 953, 196	130, 768, 429	90, 407, 132	129, 111, 736
Northern Western Interior (Iowa, Missouri, and Kansas)	19, 046, 271	18, 250, 210	18, 884, 401	21, 821, 354	21, 421, 872	14, 829, 214	19, 109, 889
Middle Western Interior (Arkansas and Oklahoma)	6, 399, 877	5, 345, 686	5, 602, 926	6, 530, 423	7, 040, 816	5, 231, 133	6, 952, 884
Southwestern Interior (Texas, bituminous)	1, 247, 988	1, 197, 792	1, 025, 093	1, 259, 276	1, 074, 183	734, 087	545, 227
Gulf Coast (Texas, lignite)	1, 181, 156	891, 116	962, 410	1, 096, 539	1, 186, 952	946, 569	1, 069, 788
Northern Great Plains (North Dakota, lignite)	495, 320	528, 078	634, 912	790, 548	719, 733	840, 959	948, 625
Rocky Mountains (Montana, Wyoming, Colorado, Utah, and New Mexico)	26, 830, 183	24, 895, 418	29, 387, 850	33, 411, 401	35, 538, 828	28, 549, 606	36, 011, 001
Pacific Coast (Washington)	3, 877, 891	2, 429, 095	3, 038, 588	4, 009, 902	4, 082, 212	2, 990, 447	3, 757, 093
Grand total [1]	478, 435, 297	442, 624, 426	502, 519, 682	551, 790, 563	579, 385, 820	465, 860, 058	568, 666 683

Province	1921	1922	1923	1924	1925	1926	1927
Northern and Middle Appalachians (Pennsylvania, Ohio, Maryland, West Virginia, Eastern Kentucky, Virginia, and Tennessee)	257, 496, 572	265, 580, 998	374, 301, 172	316, 280, 532	351, 173, 229	394, 884, 385	363, 320, 442
Southern Appalachians (Alabama)	12, 568, 899	18, 324, 740	20, 457, 649	19, 130, 184	20, 004, 395	21, 000, 962	19, 765, 866
Northern Interior (Michigan)	1, 141, 715	929, 390	1, 172, 075	831, 020	808, 233	686, 707	756, 763
Eastern Interior (Illinois, Indiana, and Western Kentucky)	98, 538, 128	91, 334, 748	116, 429, 453	98, 823, 565	100, 320, 882	108, 016, 952	85, 988, 572
Northern Western Interior (Iowa, Missouri, and Kansas)	11, 549, 654	10, 215, 081	13, 557, 035	12, 197, 063	11, 933, 309	12, 050, 462	9, 457, 727
Middle Western Interior (Arkansas and Oklahoma)	4, 590, 400	3, 912, 557	4, 181, 930	3, 781, 118	3, 545, 879	4, 301, 690	5, 366, 888
Southwestern Interior (Texas, bituminous)	210, 638	265, 179	175, 332	163, 196	182, 680	170, 494	156, 899
Gulf Coast (Texas, lignite)	762, 201	840, 828	1, 011, 997	983, 815	825, 695	920, 664	1, 169, 486
Northern Great Plains (North Dakota, lignite)	864, 903	1, 327, 564	1, 385, 400	1, 200, 527	1, 324, 620	1, 370, 244	1, 527, 939
Rocky Mountains (Montana, Wyoming, Colorado, Utah, and New Mexico)	25, 589, 650	26, 702, 723	28, 704, 317	27, 381, 151	27, 154, 662	27, 138, 989	27, 338, 388
Pacific Coast (Washington)	2, 428, 722	2, 581, 165	2, 926, 392	2, 653, 667	2, 537, 890	2, 586, 568	2, 635, 062
Grand total [1]	415, 921, 950	422, 268, 099	564, 564, 662	483, 686, 538	520, 052, 741	573, 366, 985	517, 763, 352

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[1] Totals include Alaska, Arizona, California, Georgia, Idaho, Nebraska, Nevada, North Carolina, Oregon, and South Dakota, which are not covered by the group totals above.

PRODUCTION, BY WEEKS AND MONTHS

The following tables summarize the statistics of the weekly and monthly production of anthracite and bituminous coal that are first published in the Bureau of Mines weekly coal reports. The figures given are estimates based upon daily and weekly reports of cars of coal and beehive coke loaded by the principal railroads and of shipments over the Monongahela, Allegheny, Ohio, and Kanawha Rivers. The estimates are afterwards revised to agree with the results of the annual statistical reports from the producers of coal; therefore, the figures here given differ slightly from the estimates originally issued in the weekly reports.

If production in February, with 28 days, is compared to that in January, with 31 days, a downward drop is often seen, which may give a mistaken impression as to the real trend. A better indication is given by the average production per working day, and it is the practice of the Bureau of Mines in tables of monthly or weekly coal production to show the average per working day as well as the total for the period. Christmas and Fourth of July are universally observed at the mines. A number of other holidays are observed in some districts but not in others. New Year's Day is very generally observed, but in 1927 enough mines continued at work on that day so that over the country, as a whole, the day counted for three-tenths of a normal working day. February 22, on the other hand, is little observed as a holiday and in 1927 counted for nine-tenths of a working day. Table 16 shows the allowances made in the bureau's records for holidays at the bituminous mines in the last eight years. These allowances are made in the light of the daily reports of cars of coal loaded, collected by the American Railway Association. Loadings on the holiday are compared with those on the corresponding day of the weeks immediately preceding and following, and the degree of holiday observance is computed accordingly. After allowing for the observance of holidays the weighted average potential working year for the country, as a whole, was 307.5 days in 1927.

The working year in the anthracite region is somewhat less than the average for the bituminous coal industry. The region is completely unionized, and the union holidays are therefore observed by practically all mines. In addition to Eight-Hour Day (April 1) and Labor Day, the anthracite miners celebrate Mitchell Day (October 29) in memory of the ending of the famous strike of 1902. Other holidays not observed in the nonunion bituminous fields, such as Memorial Day, Thanksgiving, and Armistice Day, are now generally celebrated in the anthracite region. (See footnote to Table 20.) In consequence, the theoretical working year for the anthracite mines is 303.5 days, a figure that makes no allowance for church holy days, many of which are so generally observed as to decrease production seriously.

The statistics of weekly output of anthracite are estimated from the records of cars of anthracite loaded by the nine railroads that serve the region. The weekly figures have been adjusted to the annual total ascertained by direct canvass of the operators themselves.

Table 14.—*Estimated weekly production of bituminous coal in 1927*

Week ended—	Production (net tons)	Number of working days	Average production per working day (net tons)	Week ended—	Production (net tons)	Number of working days	Average production per working day (net tons)
Jan. 1	[1] 642,000	[1] 0.3	[2,3] 2,005,000	July 16	8,213,000	6	1,369,000
Jan. 8	13,200,000	6	2,200,000	July 23	8,226,000	6	1,371,000
Jan. 15	13,518,000	6	2,253,000	July 30	8,560,000	6	1,427,000
Jan. 22	13,421,000	6	2,237,000	Aug. 6	8,462,000	6	1,410,000
Jan. 29	13,483,000	6	2,247,000	Aug. 13	9,057,000	6	1,510,000
Feb. 5	13,530,000	6	2,255,000	Aug. 20	9,104,000	6	1,517,000
Feb. 12	13,434,000	6	2,239,000	Aug. 27	9,704,000	6	1,617,000
Feb. 19	13,141,000	6	2,190,000	Sept. 3	9,722,000	6	1,620,000
Feb. 26	12,713,000	5.9	2,155,000	Sept. 10	8,944,000	5.4	1,656,000
Mar. 5	13,210,000	6	2,202,000	Sept. 17	9,610,000	6	1,602,000
Mar. 12	13,724,000	6	2,287,000	Sept. 24	9,831,000	6	1,639,000
Mar. 19	12,969,000	6	2,162,000	Oct. 1	10,020,000	6	1,670,000
Mar. 26	13,320,000	6	2,220,000	Oct. 8	10,246,000	6	1,708,000
Apr. 2	11,011,000	5.7	1,932,000	Oct. 15	10,508,000	6	1,751,000
Apr. 9	8,223,000	6	1,371,000	Oct. 22	10,245,000	6	1,708,000
Apr. 16	7,970,000	6	1,328,000	Oct. 29	9,980,000	6	1,663,000
Apr. 23	7,906,000	6	1,318,000	Nov. 5	8,991,000	6	1,499,000
Apr. 30	8,391,000	6	1,399,000	Nov. 12	9,417,000	5.7	1,652,000
May 7	8,153,000	6	1,359,000	Nov. 19	9,959,000	6	1,660,000
May 14	8,369,000	6	1,395,000	Nov. 26	8,795,000	5.1	1,725,000
May 21	8,240,000	6	1,373,000	Dec. 3	9,017,000	6	1,503,000
May 28	8,443,000	6	1,407,000	Dec. 10	9,649,000	6	1,608,000
June 4	7,350,000	5.4	1,361,000	Dec. 17	9,750,000	6	1,625,000
June 11	8,490,000	6	1,415,000	Dec. 24	9,793,000	6	1,632,000
June 18	8,251,000	6	1,375,000	Dec. 31	7,911,000	5	1,582,000
June 25	8,446,000	6	1,408,000				
July 2	7,950,000	6	1,325,000		517,763,000	307.5	1,684,000
July 9	6,551,000	5	1,310,000				

[1] Figures represent the output and the number of working days in that part of the week included in the calendar year shown. Total production for this week was 10,626,000 tons (revised figures).

[2] Average daily production for the entire week and not for the working days that fell in the calendar year shown. [3] Revised figures.

Table 15.—*Estimated weekly production of anthracite in 1927*

Week ended—	Production (net tons)	Number of working days	Average production per working day (net tons)	Week ended—	Production (net tons)	Number of working days	Average production per working day (net tons)
Jan. 1	[1] 6,000	(2)	[3,4] 226,000	July 16	1,288,000	6	215,000
Jan. 8	1,359,000	6	227,000	July 23	1,330,000	6	222,000
Jan. 15	1,821,000	6	304,000	July 30	1,341,000	6	224,000
Jan. 22	1,478,000	6	246,000	Aug. 6	1,362,000	6	227,000
Jan. 29	1,658,000	6	276,000	Aug. 13	1,596,000	6	266,000
Feb. 5	1,392,000	6	232,000	Aug. 20	1,574,000	6	262,000
Feb. 12	1,491,000	6	249,000	Aug. 27	2,078,000	6	346,000
Feb. 19	1,558,000	6	260,000	Sept. 3	1,808,000	6	301,000
Feb. 26	1,365,000	5.5	248,000	Sept. 10	1,321,000	5	264,000
Mar. 5	1,203,000	6	201,000	Sept. 17	1,602,000	6	267,000
Mar. 12	1,478,000	6	246,000	Sept. 24	1,508,000	6	251,000
Mar. 19	1,422,000	6	237,000	Oct. 1	1,630,000	6	272,000
Mar. 26	1,164,000	6	194,000	Oct. 8	1,586,000	6	264,000
Apr. 2	1,119,000	5	224,000	Oct. 15	1,782,000	6	297,000
Apr. 9	1,640,000	6	273,000	Oct. 22	1,787,000	6	298,000
Apr. 16	1,750,000	6	292,000	Oct. 29	1,715,000	5	343,000
Apr. 23	1,651,000	6	275,000	Nov. 5	1,557,000	6	260,000
Apr. 30	1,908,000	6	318,000	Nov. 12	1,519,000	5	304,000
May 7	1,854,000	6	309,000	Nov. 19	1,937,000	6	323,000
May 14	1,975,000	6	329,000	Nov. 26	1,277,000	5	255,000
May 21	1,956,000	6	326,000	Dec. 3	1,381,000	6	230,000
May 28	1,831,000	6	305,000	Dec. 10	1,378,000	6	230,000
June 4	1,560,000	5	312,000	Dec. 17	1,371,000	6	229,000
June 11	1,720,000	6	287,000	Dec. 24	1,503,000	6	251,000
June 18	1,656,000	6	276,000	Dec. 31	1,215,000	5	243,000
June 25	1,574,000	6	262,000				
July 2	1,269,000	6	212,000		80,096,000	303.5	264,000
July 9	792,000	5	158,000				

[1] Figures represent the output in that part of the week included in the calendar year shown. Total production for this week was 1,128,000 tons (revised figures).

[2] Jan. 1 considered a full holiday, though there were a few cars loaded.

[3] Average daily production for the entire week.

[4] Revised figures.

TABLE 16.—*Holidays commonly recognized in the bituminous coal fields and the average fraction of a working day for the country as a whole that each holiday represented, 1920–1927*

	Average fraction of full working day							
	1920	1921	1922	1923	1924	1925	1926	1927
January: New Year's Day	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.3
February: Washington's Birthday	(1)	(1)	(1)	.9	.8	.9	.9	.9
April: Eight Hour Day (Apr. 1)	.3	.3	.3	.4	.5	.6	.7	.7
May: Memorial Day	.5	.2	.8	.3	.4	.4	.4	.4
July: Independence Day	--------	--------	--------	--------	--------	--------	--------	--------
September: Labor Day	.3	.3	.3	.3	.3	.4	.4	.4
November:								
General election	.5	--------	--------	--------	.4	--------	.7	--------
Armistice Day	.7	.5	.5	.4	.6	.7	.7	.7
Thanksgiving Day	.3	.3	.2	.1	.2	.3	.5	.1
December: Christmas Day	--------	--------	--------	--------	--------	--------	--------	--------

[1] Data for weighting not available.

TABLE 17.—*Estimated monthly production of bituminous coal and average production per working-day, 1924–1927,*[1] *in thousands of net tons*

Month	1924		1925		1926		1927	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
January	52,507	2,004	51,640	1,963	53,205	2,103	56,660	2,240
February	47,302	1,907	38,770	1,622	46,180	1,932	52,697	2,205
March	41,288	1,588	37,416	1,439	45,744	1,694	59,911	2,219
April	30,429	1,193	33,514	1,309	39,738	1,546	34,538	1,344
May	32,276	1,223	35,276	1,389	38,727	1,525	35,256	1,388
June	31,458	1,258	36,960	1,422	41,635	1,601	36,483	1,403
July	33,346	1,283	39,362	1,514	43,102	1,658	33,505	1,340
August	35,923	1,382	44,633	1,717	45,957	1,767	41,541	1,539
September	42,376	1,675	46,556	1,833	48,559	1,912	41,763	1,644
October	48,414	1,793	52,907	1,960	54,127	2,082	43,827	1,686
November	42,102	1,815	50,497	2,131	59,213	2,378	40,468	1,632
December	46,266	1,779	52,522	2,020	57,180	2,199	41,114	1,581
	483,687	1,573	520,053	1,692	573,367	1,864	517,763	1,684

[1] Monthly statistics from 1905 to 1923 will be found in Coal in 1922, pp. 464–465, and in Coal in 1923, pp. 541–542.

TABLE 18.—*Estimated monthly production of coal, by States, in 1927, in thousands of net tons*

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	2, 148	1, 954	2, 137	1, 555	1, 411	1, 410	1, 325	1, 756	1, 664	1, 581	1, 428	1, 397	19, 766
Arkansas	139	128	125	53	72	91	95	149	174	197	160	166	1, 549
Colorado	1, 173	943	1, 016	618	583	594	536	863	1, 060	921	563	854	9, 724
Illinois	8, 615	8, 726	10, 036	227	227	245	358	710	1, 006	4, 823	5, 638	6, 237	46, 848
Indiana	2, 806	2, 645	3, 070	196	529	774	892	1, 333	1, 359	1, 238	1, 495	1, 599	17, 936
Iowa	654	580	656	62	55	38	44	56	76	178	218	333	2, 950
Kansas	552	480	501	60	87	125	151	211	278	347	303	349	3, 444
Kentucky:													
Eastern	4, 054	3, 715	4, 104	4, 060	4, 085	3, 948	3, 928	4, 720	4, 491	4, 162	3, 388	3, 264	47, 919
Western	1, 629	1, 592	1, 782	1, 766	1, 700	1, 984	1, 971	2, 191	2, 106	1, 627	1, 339	1, 518	21, 205
Maryland	297	253	262	201	189	209	211	265	257	226	222	223	2, 815
Michigan	69	55	54	49	45	53	62	77	77	67	75	74	757
Missouri	346	298	337	60	91	115	151	194	246	348	386	492	3, 064
Montana	293	265	247	244	205	165	131	251	291	331	358	363	3, 144
New Mexico	259	245	269	210	230	210	174	242	259	274	289	274	2, 935
North Dakota	174	142	127	69	52	41	31	56	104	215	271	246	1, 528
Ohio	3, 440	3, 053	3, 384	570	545	670	624	693	734	738	676	673	15, 800
Oklahoma	318	280	306	239	242	242	247	323	367	422	405	427	3, 818
Pennsylvania, bituminous	13, 998	13, 135	15, 044	9, 833	9, 717	10, 039	8, 853	10, 673	10, 763	10, 860	9, 825	10, 225	132, 965
Tennessee	620	559	637	499	436	429	426	472	459	428	406	412	5, 783
Texas	126	105	124	96	106	108	103	122	115	117	105	99	1, 326
Utah	456	373	374	337	264	296	318	418	414	433	522	576	4, 781
Virginia	1, 138	1, 049	1, 145	1, 137	1, 136	1, 146	1, 022	1, 128	1, 110	1, 056	945	904	12, 916
Washington	248	216	214	196	192	180	164	222	226	260	296	221	2, 635
West Virginia	12, 373	11, 310	13, 270	11, 832	12, 718	12, 982	11, 321	13, 930	13, 496	12, 185	10, 342	9, 363	145, 122
Wyoming	711	576	667	345	317	368	352	464	609	764	780	801	6, 754
Other States	24	20	23	24	22	21	15	22	22	29	33	24	279
Total bituminous	56, 660	52, 697	59, 911	34, 538	35, 256	36, 483	33, 505	41, 541	41, 763	43, 827	40, 468	41, 114	517, 763
Pennsylvania anthracite	6, 516	5, 812	6, 056	7, 078	7, 947	7, 207	4, 993	7, 694	6, 596	7, 353	6, 854	5, 990	80, 096
Grand total	63, 176	58, 509	65, 967	41, 616	43, 203	43, 690	38, 498	49, 235	48, 359	51, 180	47, 322	47, 104	597, 859

TABLE 19.—*Estimated daily output of coal, by States, in each month of 1927, in thousands of net tons*

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	84.9	81.8	79.1	60.5	55.6	54.2	53.0	65.0	65.5	60.8	57.6	53.7	64.3
Arkansas	5.5	5.4	4.6	2.1	2.8	3.5	3.8	5.5	6.9	7.6	6.5	6.4	5.0
Colorado	46.4	39.4	37.6	24.1	22.9	22.9	21.5	32.0	41.7	35.4	22.7	32.9	31.6
Illinois	340.5	365.1	371.7	8.8	8.9	9.4	14.3	26.3	39.6	185.5	227.3	239.9	152.4
Indiana	110.9	110.7	113.7	7.6	20.8	29.8	35.7	49.4	53.5	47.6	60.3	61.5	58.3
Iowa	25.8	24.3	24.3	2.4	2.2	1.5	1.8	2.1	3.0	6.8	8.8	12.8	9.6
Kansas	21.8	20.1	18.6	2.3	3.4	4.8	6.0	7.8	11.0	13.3	12.2	13.4	11.2
Kentucky:													
Eastern	160.2	155.4	152.0	158.0	160.8	151.8	157.1	174.8	176.8	160.1	136.6	125.5	155.8
Western	64.4	66.6	66.0	68.7	66.9	76.3	78.8	81.1	82.9	62.6	54.0	58.4	69.0
Maryland	11.7	10.6	9.7	7.8	7.4	8.0	8.4	9.8	10.1	8.7	9.0	8.6	9.2
Michigan	2.7	2.3	2.0	1.9	1.8	2.0	2.5	2.8	3.0	2.6	3.0	2.8	2.5
Missouri	13.7	12.5	12.5	2.3	3.6	4.4	6.0	7.2	9.7	13.4	15.6	18.9	10.0
Montana	11.6	11.1	9.1	9.5	8.1	6.3	5.2	9.3	11.5	12.7	14.4	14.0	10.2
New Mexico	10.2	10.3	10.0	8.2	9.0	8.1	7.0	9.0	10.2	10.5	11.7	10.5	9.5
North Dakota	6.9	5.9	4.7	2.7	2.0	1.6	1.2	2.1	4.1	8.3	10.9	9.5	5.0
Ohio	136.0	127.7	125.3	22.2	21.5	25.8	25.0	25.7	28.9	28.4	27.3	25.9	51.4
Oklahoma	12.6	11.7	11.3	9.3	9.5	9.3	10.0	12.0	14.4	16.2	16.3	16.4	12.4
Pennsylvania, bituminous	553.3	549.6	557.2	382.6	382.6	386.1	354.1	395.3	423.7	417.7	396.2	393.3	432.4
Tennessee	24.5	23.4	23.6	19.4	17.2	16.5	17.0	17.5	18.1	16.5	16.4	15.8	18.8
Texas	5.0	4.4	4.6	3.8	4.2	4.2	4.1	4.5	4.5	4.5	4.2	3.8	4.3
Utah	18.0	15.6	13.9	13.1	10.4	11.4	12.7	15.5	16.3	16.7	21.0	22.2	15.5
Virginia	45.0	43.9	42.4	44.3	44.7	44.1	40.9	41.8	43.7	40.6	38.1	34.8	42.0
Washington	9.8	9.0	7.9	7.6	7.6	6.9	6.6	8.2	8.9	10.0	11.9	8.5	8.6
West Virginia	489.1	473.2	491.5	460.4	500.7	499.3	452.8	515.9	531.3	468.7	417.0	360.1	471.9
Wyoming	28.1	24.1	24.7	13.4	12.5	14.2	14.1	17.2	24.0	29.4	31.5	30.8	22.0
Other States	.9	.8	.9	.9	.9	.8	.6	.8	.9	1.1	1.3	.9	.9
Total bituminous	2,239.5	2,204.9	2,218.9	1,343.9	1,388.0	1,403.2	1,340.2	1,538.6	1,644.2	1,685.7	1,631.8	1,581.3	1,683.8
Pennsylvania anthracite	261.0	247.0	224.0	283.0	318.0	277.0	200.0	285.0	264.0	294.0	286.0	230.0	264.0
Grand total	2,500.5	2,451.9	2,442.9	1,626.9	1,706.0	1,680.2	1,540.2	1,823.6	1,908.2	1,979.7	1,917.8	1,811.3	1,947.8

TABLE 20.—*Estimated monthly production of anthracite and average production per working day,*[1] *1922–1927, in thousands of net tons*

Month	1922		1923		1924		1925		1926		1927	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
January	6,566	263	8,521	328	7,724	297	7,234	278	172	7	6,516	261
February	7,096	296	7,602	317	7,428	297	7,003	292	2,069	86	5,812	247
March	9,181	340	9,175	340	7,908	304	6,886	265	8,732	323	6,056	224
April	27	1	7,885	329	6,639	265	7,292	292	8,163	327	7,078	283
May	36	1	8,384	322	7,549	290	7,938	318	8,001	320	7,947	318
June	86	3	8,474	326	7,509	300	7,616	293	8,878	341	7,207	277
July	118	5	8,136	325	7,584	292	8,334	321	8,371	322	4,993	200
August	164	6	8,672	321	6,906	266	9,014	347	8,171	314	7,694	285
September	5,075	203	2,853	119	7,408	296	52	2	8,388	336	6,596	264
October	8,896	356	8,532	328	7,479	288	69	3	8,617	345	7,353	294
November	8,695	362	7,575	316	6,604	287	153	7	7,397	308	6,854	286
December	8,743	350	7,530	301	7,189	277	226	9	7,478	288	5,990	230
	54,683	180	93,339	307	87,927	288	61,817	203	84,437	278	80,096	264

[1] Production up to 1923 was estimated from monthly shipments as reported by the Anthracite Bureau of Information, since 1923 from weekly car loadings as reported by the American Railway Association, and includes mine fuel, coal sold locally, dredge coal, and the output of the Bernice Basin in Sullivan County. In computing the average rates per working-day New Year's, Eight Hour Day (Apr. 1), Memorial Day, Independence Day, Labor Day, Mitchell Day (Oct. 29), Thanksgiving Day, Christmas Day, and, since the war, Armistice Day, have been counted as holidays. No allowance, however, has been made for church holy days which are observed by many of the miners. Monthly statistics from 1905 to 1921 will be found in Coal in 1925, pp. 427–428.

FLUCTUATIONS OF BITUMINOUS COAL PRODUCTION

In response to many requests the diagram showing the average production of bituminous coal per working day for each month since 1905 has been completed through 1927. (See fig. 1.)

The chart first appeared in the April, 1924, issue of the Steam Coal Buyer in an article by David L. Wing and F. G. Tryon. It was subsequently published in the coal chapter of Mineral Resources of the United States, 1923, Part II. With the addition of 1924 to 1927, inclusive, the curve represents a continuous record over a 23-year period.

Comparisons of total production in months of unequal length, such as February and March, are misleading. A better comparative measure is the average production per working day. This datum has been selected for plotting the curve that brings to view the monthly fluctuations in the output of bituminous coal from 1905 through 1927.

BITUMINOUS OUTPUT AS AN INDUSTRIAL BAROMETER

Soft coal is chiefly an industrial fuel, and it is natural to expect the output to fluctuate in consonance with business conditions. The *consumption* of bituminous coal is probably as good a measure as any of the activity of business as a whole. But the *production* of soft coal for a given month or even year may be a very different thing from *consumption* because of the movement of coal in and out of consumers' storage. Furthermore, differences in rates of consumption in summer and winter give a distinct seasonal rhythm to the demand for coal. Finally, recurrent labor difficulties introduce into the coal curve an element that has little immediate relation to business conditions. To sum up, the value of bituminous output as a business indicator is marred by the ebb and flow of coal into storage, by the seasonal character of the market, and by the great dislocation caused by strikes.

SEASONAL CHARACTER OF THE INDUSTRY

In spite of the large proportion of bituminous coal utilized by industries not commonly regarded as seasonal the curve in the diagram indicates distinct seasonal fluctuations. This seasonal variation in demand is marked during the pre-war years. It is obscured in 1917 and 1918 by the unusual conditions of the war period but recurs with heightened effect in 1919 and continues accentuated during the past few years. There have been years, such as 1923, when the seasonal variation in soft-coal production was mitigated. But the normal coal year is usually characterized by two periods of approximately equal duration—one of slack demand and falling prices, the other of increased demand and rising prices.

Differences in rates of consumption in summer and winter give distinct seasonal rhythm to the demand for coal, the extent of which is sometimes underestimated. The peak load of the railroads that consume about 30 per cent of the production is reached during the fall and winter months. At the same time public utilities increase consumption to meet greater seasonal demands for light and power, while additional quantities of fuel are needed by householders, factories, railroad stations, and office buildings simply to keep people warm. With the advent of mild spring temperatures there is a sharp fall in demand that is ordinarily reflected in declining output.

EFFECTS OF WAGE NEGOTIATIONS

General strikes or suspensions in the organized fields have occurred at the termination of many of the biennial wage agreements. These account for the characteristic features in "even" years of recurring peaks and valleys in the curve of bituminous output. In the period before the war it was customary for the mines in the central competitive field to close down almost completely during the 1, 2, cr 3 months while the new working agreement was being framed. In anticipation of a shortage consumers bought heavily in the months immediately preceding the suspension. It was a strike that produced the extraordinary peak and valley in the fall of 1919, and the general suspension of 1922 reduced production in April of that year to the lowest point during the 23 years covered by the record.

RECENT TREND OF PRODUCTION

Throughout 1923 bituminous coal production was maintained at a level considerably above the current rate of consumption. With the effects of the great suspension of 1922 still fresh in mind consumers were largely interested in replenishing depleted stock piles. The market was also somewhat uneasy regarding the probable outcome of the wage negotiations scheduled for 1924.

With supply assured after the signing of the Jacksonville wage agreement to run from April 1, 1924, to March 31, 1927, and with consumers' stocks at high levels the soft-coal industry suffered a period of acute depression—a condition that was carried far into 1925. The suspension in the anthracite region in the fall of 1925, however, relieved the situation in the bituminous trade. As the strike continued, the demand for soft coal to replace anthracite in domestic use expanded until November, 1925, when the average output per day reached the highest point since 1918.

Soft-coal production, maintained at a high level during the first two months of 1926, was curtailed with the termination of labor difficulties in the anthracite fields. Domestic industry, however, was moving at high speed, and additional impetus was given the bituminous coal trade by an accelerated demand for coal to be exported. This demand for export coals, caused by the British strike, gained strength at about midsummer and continued to grow throughout the fall. In response, bituminous production climbed steadily until November, when the average output per working day reached 2,378,000 tons, the highest figure on record. When news arrived on November 19 of the collapse of the British strike a downward trend in both production and prices was suddenly and severely accelerated, the effect of which is seen in the sharp drop in production during December.

For the first three months of 1927 the bituminous trade was stimulated by the prospect of a serious labor disturbance at the expiration of the Jacksonville wage agreement on March 31. Consumers accumulated large reserves, and production was maintained at a point not far below the high record established in November of the previous year. As a result, on April 1, when the miners of the central competitive field laid down their tools, there was 75,000,000 tons of bituminous coal in storage. Following the suspension in the organized districts average daily production declined to 1,344,000 tons in April in comparison with 2,219,000 tons in March. Heavy stocks and relatively weak demand were depressing factors in the market, and even after the resumption of mining in the majority of districts the output remained far below normal.

MEN EMPLOYED

The method of collecting employment statistics is explained in detail in Coal in 1925, pages 428 to 431. It is believed these statistics represent the most accurate returns obtainable under present conditions, both as to the records generally available in mine offices and as to the funds allotted to the Bureau of Mines for collecting data.

The number of men employed at bituminous coal mines reached a maximum in 1923, when 704,793 men were reported. By the end of 1925 there was a reduction of 116,300 men, the total number reported for 1925 being 588,493. Larger output and better business in 1926 brought a slight increase in the working force, and a total of 593,647 men was reported. The number employed in 1927 was 593,918, almost the same as in the year before.

TABLE 21.—*Comparative number of employees in coal mines, by States, 1923, 1924, 1926, and 1927*

State	Average number employed				Per cent of increase or decrease		
	1923	1924	1926	1927	1923–1927	1924–1927	1926–1927
Alabama	30,035	27,956	27,345	27,615	−8.1	−1.2	+1.0
Arkansas	3,754	3,350	3,589	3,706	−1.3	+10.6	+3.3
Colorado	13,340	12,954	12,815	11,999	−10.1	−7.4	−6.4
Illinois	99,714	89,363	75,870	76,970	−22.8	−13.9	+1.4
Indiana	35,408	27,558	23,404	24,352	−31.2	−11.6	+4.1
Iowa	11,448	12,101	8,869	8,741	−23.6	−27.8	−1.4
Kansas	9,761	8,561	8,172	7,004	−28.2	−18.2	−14.3
Kentucky	60,811	55,766	60,578	64,747	+6.5	+16.1	+6.9
Maryland	3,725	3,776	3,681	3,459	−7.1	−8.4	−6.0
Michigan	1,977	1,551	1,573	1,512	−23.5	−2.5	−3.9
Missouri	6,952	5,977	5,270	6,232	−10.4	+4.3	+18.3
Montana	3,511	3,196	2,419	2,281	−35.0	−28.6	−5.7
New Mexico	4,095	4,206	3,167	3,456	−15.6	−17.8	+9.1
North Dakota	1,621	1,298	1,288	1,341	−17.3	+3.3	+4.1
Ohio	54,555	44,229	38,547	35,543	−34.8	−19.6	−7.8
Oklahoma	7,130	6,144	5,400	5,796	−18.7	−5.7	+7.3
Pennsylvania, bituminous	194,981	169,322	155,999	153,699	−21.2	−9.2	−1.5
Tennessee	11,244	9,365	7,948	7,691	−31.6	−17.9	−3.2
Texas	2.452	2,195	1,650	1,674	−31.7	−23.7	+1.5
Utah	4,381	4,330	3,545	3,339	−23.8	−22.9	−5.8
Virginia	14,120	12,679	13,764	13,211	−6.4	+4.2	−4.0
Washington	4,306	3,858	3,609	3,407	−20.9	−11.7	−5.6
West Virginia	117,300	102,203	118,726	119,799	+2.1	+17.2	+.9
Wyoming	7,529	7,113	5,862	5,791	−23.1	−18.6	−1.2
Other States [1]	643	553	557	553	−14.0	----------	−.7
Total bituminous	704,793	619,604	593,647	593,918	−15.7	−4.1	----------
Pennsylvania anthracite	157,743	160,009	165,386	165,259	+4.8	+3.3	−.1
Grand total	862,536	779,613	759,033	759,177	−12.0	−2.6	----------

[1] Includes Alaska, Arizona (1926 and 1927), California, Georgia, Idaho, Nebraska (1924), Nevada (1927), North Carolina, Oregon, and South Dakota.

TABLE 22.—*Men employed underground and on the surface in coal mines, 1918–1927*

[Corresponding data for the years 1911 to 1916 will be found in Coal in 1924, p. 481]

Year	Underground						Surface		Total number
	Miners, loaders, and shot firers		All others [1]		Total underground				
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	
Anthracite:									
1918	(2)	(2)	(2)	(2)	101,671	69.1	45,450	30.9	147,121
1919	(2)	(2)	(2)	(2)	107,829	69.8	46,742	30.2	154,571
1920	63,339	43.6	37,684	26.1	101,023	69.7	44,051	30.3	145,074
1921	73,977	46.4	42,840	26.8	116,817	73.2	42,682	26.8	159,499
1922	72,527	46.2	41,752	26.6	114,279	72.8	42,570	27.2	156,849
1923	72,362	45.9	42,359	26.8	114,721	72.7	43,022	27.3	157,743
1924	76,035	47.5	43,328	27.1	119,363	74.6	40,646	25.4	160,009
1925	78,773	49.1	41,795	26.1	120,568	75.2	39,744	24.8	160,312
1926	81,963	49.5	44,268	26.8	126,231	76.3	39,155	23.7	165,386
1927	82,583	50.0	44,614	27.0	127,197	77.0	38,062	23.0	165,259
Bituminous:									
1918	(2)	(2)	(2)	(2)	496,252	80.7	119,053	19.3	615,305
1919	(2)	(2)	(2)	(2)	508,801	81.8	113,197	18.2	621,998
1920	355,660	55.5	174,152	27.3	529,812	82.8	109,735	17.2	639,547
1921	399,270	60.1	168,019	25.4	567,289	85.5	96,465	14.5	663,754
1922	407,772	59.3	174,637	25.3	582,409	84.6	105,549	15.4	687,958
1923	422,040	59.9	178,265	25.3	600,305	85.2	104,488	14.8	704,793
1924	380,324	61.4	151,580	24.4	531,904	85.8	87,700	14.2	619,604
1925	367,456	62.5	139,085	23.6	506,541	86.1	81,952	13.9	588,493
1926	370,292	62.3	140,532	23.7	510,824	86.0	82,823	14.0	593,647
1927	372,565	62.7	139,541	23.5	512,106	86.2	81,812	13.8	593,918

[1] Includes haulage and trackmen

[2] No data.

TABLE 23.—*Men employed in coal mines, by States, in 1927*

State	Underground						Surface		Total number
	Miners, loaders, and shot firers		Haulage and track		All others		Number	Per cent	
	Number	Per cent	Number	Per cent	Number	Per cent			
Alabama	16,233	58.8	3,383	12.2	3,662	13.3	4,337	15.7	27,615
Alaska	56	36.4	10	6.5	27	17.5	61	39.6	154
Arizona	8	100.0	------	------	------	------	------	------	8
Arkansas	2,278	61.5	418	11.3	347	9.3	663	17.9	3,706
California, Idaho, Nevada and Oregon	44	50.0	6	6.8	18	20.5	20	22.7	88
Colorado	7,429	61.9	1,352	11.3	1,283	10.7	1,935	16.1	11,999
Georgia	------	------	------	------	------	------	114	100.0	114
Illinois	53,798	69.9	7,893	10.3	8,003	10.4	7,276	9.4	76,970
Indiana	14,925	61.3	2,808	11.5	2,594	10.6	4,025	16.6	24,352
Iowa	6,353	72.7	894	10.2	838	9.6	656	7.5	8,741
Kansas	5,054	72.2	473	6.8	336	4.7	1,141	16.3	7,004
Kentucky	39,053	60.3	8,271	12.8	8,005	12.4	9,418	14.5	64,747
Maryland	2,254	65.2	419	12.1	336	9.7	450	13.0	3,459
Michigan	1,085	71.8	165	10.9	145	9.6	117	7.7	1,512
Missouri	3,887	62.4	381	6.1	507	8.1	1,457	23.4	6,232
Montana	1,366	59.9	314	13.8	233	10.2	368	16.1	2,281
New Mexico	2,050	59.3	384	11.1	410	11.9	612	17.7	3,456
North Carolina	80	57.1	21	15.0	14	10.0	25	17.9	140
North Dakota	744	55.5	75	5.6	56	4.2	466	34.7	1,341
Ohio	24,531	69.0	3,290	9.3	3,255	9.2	4,467	12.5	35,543
Oklahoma	3,418	59.0	700	12.1	493	8.5	1,185	20.4	5,796
Pennsylvania, bituminous	101,200	65.8	15,878	10.3	17,226	11.3	19,395	12.6	153,699
South Dakota	49	100.0	------	------	------	------	------	------	49
Tennessee	4,868	63.3	920	12.0	811	10.5	1,092	14.2	7,691
Texas	1,130	67.5	157	9.4	139	8.3	248	14.8	1,674
Utah	1,968	58.9	429	12.8	326	9.8	616	18.5	3,339
Virginia	6,590	49.9	1,915	14.5	2,694	20.4	2,012	15.2	13,211
Washington	1,967	57.7	355	10.4	373	10.9	712	20.9	3,407
West Virginia	66,585	55.6	17,385	14.5	17,814	14.9	18,015	15.0	119,799
Wyoming	3,562	61.5	720	12.5	580	10.0	929	16.0	5,791
Total bituminous	372,565	62.7	69,016	11.6	70,525	11.9	81,812	13.8	593,918
Pennsylvania anthracite	82,583	50.0	18,186	11.0	26,428	16.0	38,062	23.0	165,259
Grand total	455,148	60.0	87,202	11.4	96,953	12.8	119,874	15.8	759,177

DAYS WORKED BY MINES

TABLE 24.—*Average number of days worked by coal mines, by States, 1918–1927*

State	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Alabama	278	239	247	166	215	232	220	246	266	231
Alaska	254	280	240	244	147	220	287	243	221	229
Arizona	------	------	------	------	------	------	------	------	90	156
Arkansas	204	136	176	112	81	97	134	112	135	137
California [1]	240	59	181	149	250	206	156	174	103	208
Colorado	255	225	255	164	191	174	178	192	202	196
Georgia	258	284	294	183	242	231	248	220	253	250
Illinois	238	160	213	152	120	158	148	161	172	114
Indiana	227	148	192	128	110	136	136	159	173	120
Iowa	245	176	250	148	131	181	161	153	183	114
Kansas	234	182	204	137	125	139	151	169	158	138
Kentucky	230	189	182	152	140	152	174	206	230	237
Maryland	261	179	207	120	101	178	173	209	235	220
Michigan	237	179	261	196	162	222	178	186	171	188
Missouri	235	175	233	166	113	155	135	166	174	151
Montana	264	194	250	143	140	179	173	171	162	197
New Mexico	301	273	302	150	216	216	204	202	251	251
North Carolina	40	100	288	300	167	275	287	272	292	284
North Dakota	229	216	218	194	175	182	165	153	162	168
Ohio	223	164	188	134	100	150	143	151	159	98
Oklahoma	228	184	217	141	114	133	124	153	183	197
Oregon	292	259	307	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Pennsylvania, bituminous	269	218	244	151	154	213	180	200	224	203
South Dakota	145	164	133	129	138	122	138	143	127	125
Tennessee	265	201	234	154	163	183	159	211	234	235
Texas	262	227	242	139	185	178	166	150	195	202
Utah	258	239	252	151	204	160	182	179	186	209
Virginia	277	247	262	166	198	212	226	254	263	238
Washington	275	217	260	159	194	213	202	193	198	210
West Virginia	238	200	198	149	143	169	182	225	247	235
Wyoming	268	221	264	167	128	192	176	178	181	189
Total bituminous	249	195	220	149	142	179	171	195	215	191
Pennsylvania anthracite	293	266	271	271	151	268	274	182	244	225
Grand total	258	209	230	173	144	195	192	192	221	199

[1] California includes Idaho, 1918–1927; Oregon, 1921–1927; Nebraska in 1924; and Nevada in 1927.

LENGTH OF WORKING DAY

ESTABLISHED WORKING DAY

The established working day in the coal mines of the United States is now generally 8 hours. When market and other conditions permit, the mines work 6 days a week, and the established working week is 48 hours. Beginning with 1918, more than 90 per cent of the men have been employed in 8-hour mines, but there has been a slight increase in the proportion of 9 and 10 hour mines since 1922.

TABLE 25.—*Number of bituminous coal mines having established working day of certain length and number of men employed in 1927*

State	8 hours [1]		9 hours		10 hours		All others [2]		Total	
	Mines	Men	Mines	Men	Mines	Men	Mines	Men	Mines	Men
Alabama	81	6,477	99	16,734	23	2,527	28	1,877	231	27,615
Alaska	4	144	------	------	------	------	4	10	8	154
Arkansas	81	3,600	------	------	1	100	1	6	83	3,706
California, Arizona, Idaho, Nevada, and Oregon	2	83	------	------	------	------	6	13	8	96
Colorado	148	11,725	------	------	------	------	81	274	229	11,999
Georgia	1	114	------	------	------	------	------	------	1	114
Illinois	369	76,084	1	4	------	------	175	882	545	76,970
Indiana	178	24,138	2	28	------	------	27	186	207	24,352
Iowa	135	8,499	------	------	------	------	48	242	183	8,741
Kansas	144	6,402	2	34	------	------	89	568	235	7,004
Kentucky	571	57,879	34	5,652	13	863	16	353	634	64,747
Maryland	57	3,158	------	------	------	------	28	301	85	3,459
Michigan	8	1,512	------	------	------	------	------	------	8	1,512
Missouri	154	5,723	3	34	3	60	63	415	223	6,232
Montana	31	2,136	------	------	2	64	27	81	60	2,281
New Mexico	29	3,247	------	------	------	------	8	209	37	3,456
North Carolina	2	140	------	------	------	------	------	------	2	140
North Dakota	38	789	1	5	4	205	110	342	153	1,341
Ohio	444	34,426	8	129	8	496	139	492	599	35,543
Oklahoma	95	5,480	6	283	------	------	8	33	109	5,796
Pennsylvania	1,620	148,568	55	3,460	2	173	153	1,498	1,830	153,699
South Dakota	------	------	------	------	------	------	19	49	19	49
Tennessee	87	6,825	2	439	2	424	1	3	92	7,691
Texas	13	781	13	515	3	378	------	------	29	1,674
Utah	34	3,329	------	------	------	------	2	10	36	3,339
Virginia	96	12,935	1	140	------	------	3	136	100	13,211
Washington	43	3,371	------	------	------	------	11	36	54	3,407
West Virginia	1,063	113,817	28	5,164	9	543	49	275	1,149	119,799
Wyoming	59	5,770	------	------	1	12	2	9	62	5,791
	5,587	547,152	255	32,621	71	5,845	1,098	8,300	7,011	593,918

[1] Includes outside employees working 9 or 10 hours a day at many mines where the established time for underground workers is 8 hours.

[2] Includes employees in mines where the established working day was changed during year, or where the working day was irregular, or which failed to answer the inquiry.

TABLE 26.—*Per cent of men employed in bituminous coal mines that had established working days of 8, 9, and 10 hours, 1905–1927* [1]

Year	Per cent of total employees in—			Weighted average working day (hours)	Year	Per cent of total employees in—			Weighted average working day (hours)
	8-hour mines	9-hour mines	10-hour mines			8-hour mines	9-hour mines	10-hour mines	
1905	61.1	13.6	25.3	8.6	1917	79.0	12.6	8.4	8.3
1906	63.0	13.5	23.5	8.6	1918	90.6	6.7	2.7	8.12
1907	64.0	11.6	24.4	8.6	1919	95.5	3.5	1.0	8.06
1908	63.5	11.1	25.4	8.6	1920	97.1	2.0	.9	8.04
1910	62.1	11.3	26.6	8.6	1921	96.6	2.9	.5	8.04
1911	62.9	10.9	26.2	8.6	1922	95.1	4.0	.9	8.06
1912	61.6	11.5	26.9	8.6	1923	94.7	4.2	1.1	8.06
1913	61.9	15.2	22.9	8.6	1924	93.7	5.1	1.2	8.08
1914	60.7	15.4	23.9	8.6	1925	93.5	5.4	1.1	8.08
1915	59.6	17.0	23.4	8.6	1926	93.7	5.5	.8	8.07
1916	58.6	17.4	24.0	8.6	1927	93.4	5.6	1.0	8.08

[1] Calculated on base of total number of men in mines definitely reported as having 8, 9, or 10 hour day. A small number of mines that work more than 10 hours or less than 8 hours have been excluded, as have also all mines for which the reports were defective or which changed their working day during the year.

AVERAGE TIME SPENT UNDERGROUND

In discussing the length of the working day in the coal mines it is necessary to distinguish between the established working day and the time actually spent at work. The established working day does not of itself measure the length of time the men actually work, because the mine may shut down before the full day is out, because the miner may go home before the mine stops, and because he spends a certain amount of time going to and from his place of work underground. Allowing for these other factors, how much time does the man actually spend at work and how long is he underground?

As interpreted in the union wage agreements, the 8-hour day means 8 hours of labor at the usual working place, exclusive of time for lunch and exclusive of time spent in going from the entrance of the mine to the working place and back again. In general, this provision applies both to piece workers and day-wage workers underground, though certain classes of daymen have duties to be performed outside the 8 hours. Motormen and drivers are ordinarily required to take motors and mules on their own time to and from the stables and the parting or station where they begin hauling, and this time is not counted as part of the day's labor.

Although the wage agreements specify 8 hours of labor, it does not follow that men are always at work 8 hours in the day. Shortage of railroad cars at the tipple, lack of orders, a petty strike, or a breakdown within the mine may cause it to stop work before the 8 hours are over. Time-workers may lose fractional days through sickness or accident. In particular, the tonnage men, who constitute 40 to 70 per cent of the working force, may leave early before the mine as a whole stops work, because the custom of the industry allows them that freedom. Only in the rarest instances is a record kept of the time these men are in the mine. Sometimes they leave because they have finished their allotted work for the day, sometimes because they feel sick or have other interests to attend to, or sometimes simply because they have earned enough for one day. The amount and the causes of this early quitting have been a subject of discussion and even of controversy between operators and employees.

The nominal working day, therefore, measures neither the length of time spent by the men at work nor the length of time they are underground, and it was not until recently that any figures on these points were available. In connection with its periodic surveys of miners' earnings, the Bureau of Labor Statistics arranged to have a special record kept of the time actually spent in the mine by many thousands of tonnage men during typical biweekly pay periods. The results, which show the time spent at the working place and also the total time in the mine, will be found in publications of the Bureau of Labor Statistics, United States Department of Labor, as follows: Monthly Labor Review for July, 1925, pages 68 to 87, and for February, 1926, pages 77 to 87, Bulletins 316, 416, and 454.

OUTPUT PER MAN

TABLE 27.—*Coal produced per man per day and per year, by States, 1918–1927, in net tons*

State	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Per man per day:										
Alabama	2.63	2.42	2.56	2.93	3.01	2.93	3.11	3.00	2.89	3.10
Arkansas	2.75	2.76	2.94	3.03	3.32	3.39	3.24	2.99	3.00	3.05
Colorado	3.36	3.88	3.51	3.83	3.87	[1] 4.45	[1] 4.52	[1] 4.07	[1] 4.11	[1] 4.13
Illinois	4.37	4.48	4.78	4.80	5.05	5.02	5.16	5.33	5.31	5.36
Indiana	4.45	4.72	4.86	4.86	5.19	5.43	5.75	5.89	5.72	6.13
Iowa	2.51	2.59	2.61	2.69	2.55	2.75	2.80	3.02	2.85	2.96
Kansas	3.03	2.89	3.19	3.08	3.02	3.19	3.29	3.44	3.43	3.57
Kentucky	3.50	3.49	3.95	4.11	4.89	4.83	4.67	4.68	4.52	4.50
Maryland	3.10	3.13	3.50	3.27	3.15	3.42	3.27	3.61	3.56	3.70
Michigan	2.42	2.65	2.65	2.63	2.65	2.67	3.00	2.75	2.55	2.67
Missouri	2.51	2.44	2.56	2.50	2.88	3.07	3.08	3.18	3.27	3.26
Montana	3.77	4.05	4.19	4.57	5.03	5.00	5.26	6.64	7.14	6.99
New Mexico	3.26	3.07	3.26	3.58	3.61	3.28	3.25	3.68	3.54	3.38
North Dakota	3.79	3.63	3.75	4.19	4.39	4.60	5.62	6.61	6.56	6.78
Ohio	4.24	4.41	4.73	4.60	4.92	4.95	4.82	4.67	4.56	4.52
Oklahoma	2.50	2.45	2.70	2.70	3.12	2.99	3.05	2.70	2.88	3.35
Pennsylvania, bituminous	3.81	3.96	3.96	4.03	3.84	4.15	4.27	4.36	4.37	4.26
Tennessee	2.41	2.25	2.48	2.80	2.59	2.93	3.05	3.11	3.11	3.20
Texas	2.19	2.03	2.26	2.42	2.10	2.72	3.16	3.19	3.39	3.92
Utah [1]	4.79	5.03	5.29	6.10	5.18	6.73	5.70	5.90	6.65	6.84
Virginia	3.38	3.26	3.06	3.78	3.93	3.92	3.73	3.69	3.91	4.11
Washington	2.91	2.74	2.89	3.52	2.96	3.19	3.41	3.52	3.62	3.68
West Virginia	4.22	4.18	4.39	4.79	5.10	5.44	5.48	4.94	4.90	5.15
Wyoming	4.66	4.48	4.69	5.08	5.15	5.23	5.41	5.90	6.15	6.18
Total bituminous	3.78	3.84	4.00	4.20	4.28	4.47	4.56	4.52	4.50	4.55
Pennsylvania anthracite	[2] 2.29	2.14	[2] 2.28	2.09	[2] 2.31	2.21	2.00	2.12	2.09	2.15
Grand total	3.45	3.41	3.65	3.55	3.89	3.91	3.81	4.04	3.92	3.96
Per man per year:										
Alabama	732	578	632	487	647	680	684	738	768	716
Arkansas	560	375	517	340	269	329	433	335	407	418
Colorado	857	873	895	628	740	774	806	781	830	811
Illinois	1,039	716	1,018	729	606	795	765	860	914	602
Indiana	1,010	698	934	622	571	738	779	934	991	738
Iowa	615	455	653	398	334	498	452	464	522	339
Kansas	709	526	650	422	377	443	496	580	540	499
Kentucky	804	659	718	625	684	735	810	966	1,039	1,065
Maryland	808	560	726	392	318	608	565	753	836	819
Michigan	573	474	691	516	429	593	536	512	437	500
Missouri	591	427	596	415	326	477	415	527	571	499
Montana	994	785	1,048	654	704	896	909	1,136	1,157	1,377
New Mexico	982	838	985	536	779	708	662	742	890	847
North Dakota	869	784	818	813	769	837	925	1,013	1,064	1,132
Ohio	946	723	890	617	492	742	689	707	723	448
Oklahoma	570	450	586	380	356	398	379	413	526	654
Pennsylvania, bituminous	1,024	864	966	609	592	882	772	873	981	865
Tennessee	639	452	580	431	422	536	487	656	728	752
Texas	574	461	547	336	389	484	523	478	661	793
Utah	1,235	1,201	1,333	922	1,057	1,077	1,037	1,056	1,234	1,432
Virginia	935	805	803	628	779	832	843	936	1,027	978
Washington	799	594	752	560	575	680	688	681	717	773
West Virginia	1,005	835	869	715	729	919	995	1,111	1,209	1,211
Wyoming	1,249	991	1,237	849	659	1,004	950	1,051	1,111	1,166
Total bituminous	942	749	881	627	609	801	781	884	966	872
Pennsylvania anthracite	[2] 672	570	[2] 618	567	[2] 349	592	550	386	511	485
Grand total	890	713	839	615	565	763	733	777	867	788

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[1] Probably too high because of practice common in some districts of men going into mine to shoot coal and load mine cars on days when tipples or mines, as a whole, are not in operation.

[2] Heavy washery output.

TABLE 28.—*Coal produced from deep mines per man employed underground per day worked, 1911–1927, in net tons* [1]

Year	Anthracite [2]	Bituminous	Year	Anthracite [2]	Bituminous
1911	2.75	4.01	1920	2.93	4.80
1912	2.69	4.24	1921	2.70	4.86
1913	2.67	4.16	1922	2.87	4.98
1914	2.67	4.28	1923	2.70	5.15
1915	2.78	4.49	1924	2.53	5.17
1916	2.74	4.57	1925	2.60	5.09
1917	2.89	4.51	1926	2.53	5.07
1918	2.94	4.62	1927	2.65	5.11
1919	2.81	4.64			

[1] In making this computation certain estimates had to be made of the division of workers above and below ground and of the production of strip pits in the years 1911 to 1913. The probable error introduced by these estimates is too small to impair the value of the averages.

[2] Beginning with 1923, a small tonnage of culm-bank coal handled through breakers and hitherto counted as fresh-mined coal has been excluded, and the figures are therefore not exactly comparable with earlier years. The difference, however, is small. (See pp. 490 and 491.)

STRIKES, SUSPENSIONS, AND LOCKOUTS

TABLE 29.—*Men idle in strikes, suspensions, and lockouts, and time lost thereby in comparison with time lost for other causes, 1918–1927*

[Includes both anthracite and bituminous coal mines]

Year	Number of men on strike	Average number of days lost		Man days lost—		
		Per man striking	Per man employed	On account of strikes, suspensions, and lockouts	On account of no market, car shortage, and similar difficulties [1]	Total
1918	79.395	6	1	508,526	38,001,284	38,509,810
1919	453,418	35	20	15,761,410	61,023,906	76,785,316
1920	282,419	21	8	5,914,473	55,732,698	61,647,171
1921	151,263	21	4	3,106,103	108,332,246	111,438,349
1922	603,031	122	87	73,497,043	65,186,691	138,683,734
1923	197,214	20	4	3,868,543	93,359,474	97,228,017
1924	129,452	41	7	5,362,748	84,963,306	90,326,054
1925	186,369	88	22	16,433,036	69,624,737	86,057,773
1926	174,724	38	9	6,707,778	58,424,553	65,132,331
1927	193,322	138	35	26,675,109	55,488,392	82,163,501

[1] Computed by the Bureau of Mines from the operators' reports of time worked, on the assumption that the potential working time was 308 days. For 1925 and 1926, however, the potential working time of the anthracite region has been assumed to be 304 days, and for 1927, 303.5 days.

TABLE 30.—*Strikes, suspensions, and lockouts in coal mines, by States, in 1927* [1]

State	Total number of men employed	Number of men on strike	Man days idle on account of strike	Average number of days lost on account of strike	
				Per man employed	Per man on strike
Alabama	27,615				
Arkansas	3,706	389	41,810	11	107
Colorado	11,999	5,429	267,210	22	49
Illinois	76,970	66,992	10,018,566	130	150
Indiana	24,352	17,303	2,345,279	96	136
Iowa	8,741	5,624	815,764	93	145
Kansas	7,004	3,014	390,711	56	130
Kentucky	64,747	1,824	24,756	(2)	14
Maryland	3,459				
Michigan	1,512	470	1,510	1	3
Missouri	6,232	2,662	336,972	54	127
Montana	2,281				
New Mexico	3,456				
North Dakota	1,341				
Ohio [1]	35,543	26,250	5,605,443	158	214
Oklahoma	5,796	163	25,428	4	156
Pennsylvania, bituminous [1]	153,699	41,692	6,591,870	43	158
Tennessee	7,691	50	3,000	(2)	60
Texas	1,674				
Utah	3,339				
Virginia	13,211				
Washington	3,407				
West Virginia	119,799	982	47,548	(2)	48
Wyoming	5,791				
Other States	553				
Total bituminous	593,918	172,844	26,515,867	45	153
Pennsylvania anthracite	165,259	20,478	159,242	1	8
Grand total	759,177	193,322	26,675,109	35	138

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[1] This table is based on statements from the operators. The figures are compiled in the same way as in previous reports, but owing to the unusual conditions attending the strike of 1927 they tend to understate the extent of the strike and the number of coal miners who were idle during the year primarily because of the strike. This is especially true of Pennsylvania and Ohio. For example, men evicted from company houses and replaced in the mines by other men would not be counted by the operator as striking his mine, even though living in tents or barracks erected by the union. Many mines reopened after 3 or 4 months, operating with smaller working forces than before, but considering the strike over as far as they were concerned. In the Pennsylvania bituminous fields the number of men on the pay rolls in January was 152,527 and the number in December was 126, 239.

[2] One-half day or less.

MINING METHODS

TABLE 31.—*Bituminous coal mined by different methods, by States, in 1927*

State	Mined by hand		Shot off the solid		Cut by machines		From strip pits		Not specified		Total production (net tons)
	Net tons	Per cent	Net tons	Per cent	Net tons	Per cent	Net tons	Per cent	Net tons	Per cent	
Alabama	2, 144, 905	10. 8	5, 252, 612	26. 6	11, 985, 095	60. 6	367, 717	1. 9	15, 537	0. 1	19, 765, 866
Alaska	10, 430	10. 0	93, 870	90. 0							104, 300
Arizona			540	11. 8					4, 043	88. 2	4, 583
Arkansas	7, 517	. 5	838, 999	54. 2	551, 999	35. 6	150, 319	9. 7			1, 548, 834
Colorado	3, 964, 311	40. 8	759, 144	7. 8	4, 902, 002	50. 4			98, 618	1. 0	9, 724, 075
Georgia							76, 712	100. 0			76, 712
Illinois	1, 599, 200	3. 4	7, 878, 379	16. 8	34, 187, 613	73. 0	2, 814, 024	6. 0	369, 008	. 8	46, 848, 224
Indiana	323, 449	1. 8	4, 189, 415	23. 4	8, 895, 938	49. 6	4, 456, 324	24. 8	70, 632	. 4	17, 935, 758
Iowa	247, 751	8. 4	1, 752, 197	59. 4	867, 885	29. 4			81, 789	2. 8	2, 949, 622
Kansas	111, 793	3. 3	1, 642, 499	47. 7	295, 741	8. 6	1, 251, 543	36. 3	142, 186	4. 1	3, 443, 762
Kentucky:											
Eastern	1, 092, 554	2. 3	2, 709, 358	5. 6	44, 110, 518	92. 1			6, 978		47, 919, 408
Western	15, 126	. 1	1, 732, 358	8. 2	18, 098, 712	85. 3	1, 347, 008	6. 3	11, 386	. 1	21, 204, 590
Maryland	1, 956, 772	69. 5	56, 135	2. 0	777, 904	27. 6			24, 031	. 9	2, 814, 842
Michigan			15, 039	2. 0	741, 724	98. 0					756, 763
Missouri	363, 026	11. 8	396, 782	13. 0	647, 078	21. 1	1, 484, 902	48. 5	172, 555	5. 6	3, 064, 343
Montana	84, 615	2. 7	705, 432	22. 4	1, 495, 465	47. 6	822, 114	26. 2	36, 012	1. 1	3, 143, 638
New Mexico	1, 359, 471	46. 3	731, 467	24. 9	835, 356	28. 5			9, 245	. 3	2, 935, 539
North Carolina	39, 167	73. 4	14, 210	26. 6							53, 377
North Dakota	4, 341	. 3	152, 385	10. 0	618, 728	40. 5	640, 709	41. 9	111, 776	7. 3	1, 527, 939
Ohio	344, 528	2. 2	315, 429	2. 0	12, 218, 136	77. 3	2, 695, 152	17. 1	226, 452	1. 4	15, 799, 697
Oklahoma	3, 941	. 1	944, 507	24. 7	2, 210, 157	57. 9	642, 130	16. 8	17, 319	. 5	3, 818, 054
Pennsylvania	40, 293, 857	30. 3	3, 725, 600	2. 8	87, 380, 782	65. 7	1, 151, 990	. 9	412, 410	. 3	132, 964, 639
South Dakota									12, 507	100. 0	12, 507
Tennessee	756, 331	13. 1	1, 842, 883	31. 9	3, 147, 067	54. 4	4, 895	. 1	32, 191	. 5	5, 783, 367
Texas	486, 325	36. 7	425, 155	32. 1	17, 751	1. 3	397, 154	29. 9			1, 326, 385
Utah	496, 821	10. 4	[1] 841, 624	17. 6	3, 443, 035	72. 0					4, 781, 480
Virginia	64, 300	. 5	1, 762, 707	13. 6	11, 089, 035	85. 9					12, 916, 042
Washington	1, 634, 192	62. 0	780, 485	29. 6	215, 769	8. 2			4, 616	. 2	2, 635, 062
West Virginia	20, 543, 433	14. 1	3, 349, 016	2. 3	121, 141, 007	83. 5	9, 245		79, 746	. 1	145, 122, 447
Wyoming	386, 452	5. 7	2, 128, 391	31. 5	4, 166, 140	61. 7	66, 228	1. 0	6, 445	. 1	6, 753, 656
Other States	91	. 3	27, 750	99. 7							27, 841
	78, 334, 699	15. 1	45, 064, 368	8. 7	374, 040, 637	72. 2	18, 378, 166	3. 6	1, 945, 482	. 4	517, 763, 352

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[1] Includes 699,339 tons reported by the companies as "pillar coal," the method of mining which, of course, differs materially from solid shooting in rooms or entries. Indeed, most of the coal reported as shot off the solid in Utah is probably "pillar coal."

UNDERCUTTING MACHINES

TABLE 32.—*Number of coal-cutting machines in bituminous coal mines, average output per machine, and per cent of total product cut by machines, by States, 1913, 1923, 1926, and 1927*

State	Number of coal-cutting machines in use				Average output per machine (net tons)				Per cent of total product cut by machines			
	1913	1923	1926	1927	1913	1923	1926	1927	1913	1923	1926	1927
Alabama	377	395	437	469	10, 940	22, 067	27, 240	25, 555	23. 3	42. 6	56. 7	60. 6
Arkansas	27	40	105	99	9, 300	4, 769	5, 825	5, 576	11. 2	14. 6	41. 9	35. 6
Colorado	300	440	402	397	7, 705	11, 129	13, 710	12, 348	25. 0	47. 3	51. 8	50. 4
Illinois	1, 845	3, 151	2, 428	2, 556	17, 686	17, 191	21, 307	13, 375	53. 0	68. 3	74. 6	73. 0
Indiana	732	852	637	652	13, 302	16, 107	22, 934	13, 644	56. 7	54. 3	63. 0	49. 6
Iowa	28	81	78	93	4, 311	14, 584	14, 004	9, 332	1. 6	20. 7	23. 6	29. 4
Kansas	9	22	39	42	2, 458	4, 452	6, 209	7, 041	. 3	2. 2	5. 5	8. 6
Kentucky	1, 263	1, 928	1, 959	2, 028	11, 365	19, 559	28, 887	30, 675	73. 2	84. 2	89. 9	90. 0
Maryland	13	47	50	42	6, 384	12, 398	18, 398	18, 522	1. 7	25. 5	29. 9	27. 6
Michigan	130	80	62	66	6, 636	13, 579	11, 011	11, 238	70. 0	92. 7	99. 4	98. 0
Missouri	104	135	93	103	8, 307	7, 450	9, 941	6, 282	20. 0	29. 6	30. 7	21. 1
Montana	97	95	78	75	11, 099	15, 746	17, 344	19, 940	33. 2	47. 5	48. 3	47. 6
New Mexico	44	107	91	86	11, 297	7, 960	12, 273	9, 713	13. 4	29. 2	39. 6	28. 5
North Carolina	-------	1	-------	-------	-------	5, 000	-------	-------	------	13. 9	------	------
North Dakota	13	25	26	23	17, 094	17, 040	20, 758	26, 901	44. 9	30. 8	39. 4	40. 5
Ohio	1, 681	2, 351	1, 627	1, 487	19, 418	15, 260	14, 852	8, 217	90. 2	88. 5	86. 7	77. 3
Oklahoma	103	183	151	159	6, 511	8, 943	10, 664	13, 900	16. 1	56. 7	56. 6	57. 9
Pennsylvania	6, 301	6, 481	5, 037	4, 935	14, 678	17, 020	19, 303	17, 706	53. 2	64. 1	63. 5	65. 7
Tennessee	252	171	144	144	7, 312	11, 692	20, 613	21, 855	26. 7	33. 1	51. 3	54. 4
Texas	24	5	4	2	4, 204	8, 904	12, 933	8, 876	4. 2	3. 8	4. 7	1. 3
Utah	50	192	187	142	12, 510	16, 778	16, 869	24, 247	19. 2	68. 3	72. 1	72. 0
Virginia	187	277	269	281	22, 497	31, 210	43, 323	39, 463	47. 6	73. 5	82. 5	85. 9
Washington	63	26	14	14	4, 453	9, 726	15, 737	15, 412	7. 2	8. 6	8. 5	8. 2
West Virginia	2, 539	3, 936	3, 341	3, 297	15, 500	21, 592	35, 388	36, 743	55. 3	78. 7	82. 4	83. 5
Wyoming	195	208	207	196	15, 645	18, 237	18, 353	21, 256	41. 3	50. 1	58. 3	61. 7
Other States	2	-------	-------	-------	600	-------	-------	-------	4. 8	------	------	------
	16, 379	21, 229	17, 466	17, 388	14, 801	17, 779	23, 526	21, 511	50. 7	66. 9	71. 7	72. 2

TABLE 33.—*Coal mined by undercutting machines, 1918–1927*

Year	Anthracite				Bituminous coal			
	Machines in use	Quantity mined by undercutting machines (net tons)		Per cent of total fresh-mined product cut by machines	Machines in use	Quantity mined by undercutting machines (net tons)		Per cent of total product cut by machines
		Total	Average per machine			Total	Average per machine	
1918	176	1, 857, 514	10, 554	2. 1	18, 463	323, 931, 133	17, 545	55. 9
1919	(1)	1, 575, 205	(1)	1. 9	18, 959	276, 019, 799	14, 559	59. 2
1920	139	938, 073	6, 749	1. 1	19, 103	339, 813, 476	17, 788	59. 8
1921	114	979, 145	8, 589	1. 1	19, 618	272, 702, 389	13, 901	65. 6
1922	82	502, 793	6, 132	1. 0	20, 436	267, 032, 931	13, 067	63. 2
1923	162	1, 208, 542	7, 460	1. 4	21, 229	377, 435, 543	17, 779	66. 9
1924	212	1, 423, 884	6, 716	1. 7	18, 660	336, 271, 335	18, 021	69. 5
1925	159	941, 189	5, 919	1. 6	17, 551	366, 725, 758	20, 895	70. 6
1926	90	931, 650	10, 352	1. 2	17, 466	410, 912, 680	23, 526	71. 7
1927	138	1, 171, 888	8, 492	1. 5	17, 388	374, 040, 637	21, 511	72. 2

[1] Not available.

TABLE 34.—*Coal recovered from strip pits, 1914–1927*

Year	Pennsylvania anthracite				Bituminous coal				Total			
	Number of power shovels in use	Quantity mined by stripping (net tons)		Per cent of fresh-mined total that was stripped	Number of power shovels in use	Quantity mined by stripping (net tons)[1]		Per cent of total that was stripped	Number of power shovels in use	Quantity mined by stripping (net tons)		Per cent of fresh-mined total that was stripped
		Total	Average per shovel			Total	Average per shovel			Total	Average per shovel	
1914	(2)	(2)	(2)	(2)	48	1,280,946	26,686	0.3	(2)	(2)	(2)	(2)
1915	57	1,121,603	19,677	(2)	87	2,831,619	32,547	.6	144	3,953,222	27,453	0.7
1916	105	1,987,800	18,930	1.4	111	3,933,395	35,436	8	216	5,921,195	27,413	1.0
1917	76	2,301,588	30,284	2.5	182	5,789,977	31,813	1.0	258	8,091,565	31,363	1.2
1918	82	2,360,183	28,783	2.6	276	8,288,245	30,030	1.4	358	10,648,428	29,744	1.6
1919	89	2,006,879	22,549	2.4	287	5,634,951	19,634	1.2	376	7,641,830	20,324	1.4
1920	96	2,054,441	21,400	2.5	312	8,859,553	28,396	1.5	408	10,913,994	26,750	1.7
1921	85	2,027,790	23,856	2.3	279	4,699,511	16,844	1.1	364	6.727,301	18,482	1.3
1922	69	949,745	13,764	1.9	379	9,886,431	26,086	2.3	448	10,836,176	24,188	2.3
1923	95	2.263,098	23,822	2.7	442	11,844,347	26,797	2.1	537	14,107,445	26,271	2.1
1924	95	1,865,677	19,639	2.2	420	13,606,954	32,398	2.8	515	15,472,631	30,044	2.7
1925	97	1,578,478	16,273	2.7	389	16,870,907	43,370	3.2	486	18,449,385	37,962	3.2
1926	99	2,401,356	24,256	3.0	410	16,922,695	41,275	3.0	509	19,324,051	37,965	3.0
1927	112	2,153,156	19,225	2.8	455	18,378,166	40,392	3.6	567	20,531,322	36,210	3.5

[1] For the years 1914 to 1923, inclusive, the figures of quantity mined by stripping do not include a small amount which was stripped by some other means than steam shovels, so for these years the tonnages are slightly less than the total recovered by stripping shown in some of the tables in earlier reports of this series.

[2] Not available.

TABLE 35.—*Summary of stripping operations that produced bituminous coal in 1927*

[For mines that recover coal both by stripping and by underground operations the returns do not permit separating men engaged in stripping from those engaged in other work. For this reason the figures of men employed represent all persons working at these mines, including those underground. The total tons produced by both methods at these same mines are also shown]

State and county	Number of strip pits	Number of shovels	Coal produced (net tons)		Total value at same mines	Average value per ton	Number of employees				Average number of days worked	Per cent of county or State total that was mined by stripping	Average tons per man per day
							Underground						
			Mined by stripping	Total at same mines			Miners, loaders, and shot firers	All others[1]	Surface	Total			
Alabama: Walker	10	20	367,717	694,908	$1,332,000	$1.92	270	151	400	821	219	[2] 5.6	3.87
Arkansas: Franklin, Johnson, and Sebastian	5	7	150,319	150,319	540,000	3.59			196	196	114	[2] 11.7	6.70
Georgia: Walker	1	3	76,712	76,712	233,000	3.04			114	114	250	100.0	2.69
Illinois:													
Edgar, Fulton, Jackson, La Salle, St. Clair and Saline	8	26	1,543,535	1,543,535	2,443,000	1.58			475	475	164	16.6	19.78
Perry	3	9	426,049	426,049	718,000	1.69			189	189	110	26.1	20.42
Vermilion	6	8	516,404	532,450	1,177,000	2.21	16	4	260	280	202	18.9	9.42
Williamson	3	7	328,036	328,036	474,000	1.44			138	138	115	6.[illegible]	20.68
State total	20	50	2,814,024	2,830,070	4,812,000	1.70	16	4	1,062	1,082	158	6.0	16.52
Indiana:													
Clay	4	11	428,544	428,544	952,000	2.22			259	259	250	54.7	6.61
Greene	6	11	473,983	474,803	889,000	1.87	7	1	227	235	115	42.2	17.50
Owen, Vermilion, and Vigo	5	10	805,053	805,053	1,460,000	1.81			257	257	151	14.3	20.81
Pike	6	24	1,899,395	1,899,395	3,846,000	2.02			758	758	214	69.8	11.68
Sullivan	4	9	533,256	533,256	1,108,000	2.08			327	327	185	14.9	8.79
Warrick	4	9	316,093	316,093	527,000	1.67			333	333	80	21.5	11.84
State total	29	74	4,456,324	4,457,144	8,782,000	1.97	7	1	2,161	2,169	175	24.8	11.71
Kansas:													
Bourbon	2	2	14,215	14,215	34,000	2.39			19	19	253	52.5	2.96
Cherokee	13	13	616,704	616,704	1,539,000	2.49			234	234	168	66.3	15.73
Crawford	24	24	620,624	620,624	1,588,000	2.56			468	468	136	27.6	9.76
State total	39	39	1,251,543	1,251,543	3,161,000	2.53			721	721	149	36.3	11.63

Kentucky:													
Hopkins	7	20	1,164,463	1,164,463	1,748,000	1.50			548	548	212	15.6	10.04
Muhlenberg and Ohio	2	4	182,545	182,545	265,000	1.45			117	117	223	2.3	17.13
State total	9	24	1,347,008	1,347,008	2,013,000	1.49			665	665	190	1.9	10.64
Missouri:													
Barton	17	28	984,646	984,646	2,646,000	2.69			642	642	151	86.4	10.15
Bates	5	5	125,521	125,521	298,000	2.37			106	106	182	56.0	6.51
Callaway, Henry, and Howard	5	8	258,672	258,672	638,000	2.47			187	187	212	88.0	6.51
Vernon	3	3	116,063	116,063	272,000	2.34			80	80	216	93.3	6.73
State total	30	44	1,484,902	1,484,902	3,854,000	2.60			1,015	1,015	171	48.5	8.57
Montana: Rosebud	1	3	822,114	822,114	1,233,000	1.50			60	60	235	[2] 100.0	58.31
North Dakota:													
Bowman, Divide, Dunn, McKenzie, Mercer, Stark, and Ward	7	8	263,404	263,404	387,000	1.47	4		129	133	100	38.9	19.87
Burke	3	7	292,624	292,624	507,000	1.73			83	83	178	100.0	19.74
Grant	4	4	5,892	5,892	11,000	1.87			11	11	10	48.7	5.31
Hettinger	6	5	8,087	8,087	13,000	1.61			21	21	189	29.6	2.04
McLean	4	4	63,469	83,358	173,000	2.08	33	7	71	111	98	61.2	7.65
Morton	4	3	3,798	3,798	6,000	1.58			12	12	161	9.2	1.96
Oliver	3	2	3,435	3,435	5,000	1.46			4	4	234	100.0	3.67
State total	31	33	640,709	660,598	1,102,000	1.67	37	7	331	375	125	41.9	14.08
Ohio:													
Athens, Guernsey, and Stark	5	8	78,766	78,766	129,000	1.64			127	127	161	3.5	3.86
Harrison	13	32	1,542,552	1,542,552	2,415,000	1.57			701	701	216	77.3	10.17
Jefferson	7	19	789,353	789,353	1,228,000	1.56			433	433	173	26.8	10.51
Perry	3	7	263,664	263,664	362,000	1.37			121	121	140	33.2	15.54
Tuscarawas	3	3	20,817	34,725	79,000	2.28	8	3	6	17	257	2.0	7.95
State total	31	69	2,695,152	2,709,060	4,213,000	1.56	8	3	1,388	1,399	192	17.1	10.09
Oklahoma:													
Haskell	5	2	97,712	160,150	461,000	2.88	36	14	155	205	206	61.0	3.80
Mayes, Muskogee, and Wagoner	4	8	220,098	220,098	591,000	2.68			196	196	174	100.0	6.46
Rogers	3	4	121,295	121,295	336,000	2.77			120	120	193	100.0	5.23
Tulsa	3	6	203,025	215,403	683,000	3.17	20	2	145	167	194	75.4	6.64
State total	15	20	642,130	716,946	2,071,000	2.89	56	16	616	688	192	16.8	5.44
Pennsylvania:													
Allegheny	4	8	164,592	223,057	459,000	2.06	25	7	117	149	196	1.6	7.63
Beaver, Butler, Cambria, Center, Clarion, Clearfield, Clinton, Fayette, and Jefferson	10	16	217,476	294,066	528,000	1.80	94	19	185	298	185	.4	5.34
Washington	8	23	609,710	671,012	1,107,000	1.65	168	32	356	556	174	5.1	6.92
Westmoreland	5	9	160,212	540,542	981,000	1.81	164	63	104	331	273	.8	5.98
State total	27	56	1,151,990	1,728,677	3,075,000	1.78	451	121	762	1,334	204	.9	6.36
Other States [3]	7	13	477,522	477,797	455,000	.95	1		177	178	129	[2] 15.9	20.78
Grand total	255	455	18,378,166	19,407,798	36,876,000	1.90	846	303	9,668	10,817	180	3.6	9.97

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[1] Includes haulage and trackmen.

[2] Per cent of county totals, not State.

[3] Tennessee, Texas, West Virginia, and Wyoming.

UNDERGROUND LOADING MACHINES

Summary.—In 1926 a total of 10,022,195 tons of bituminous coal was loaded mechanically by 455 machines in 131 mines. In addition, there were 33 other mines reporting 43 loading machines in which the use of the machine was still in the experimental stage. These figures do not include machines that have been abandoned or a few machines that were used in 1925 and will be used again, but which loaded no coal in 1926. (See Table 36.)

Source of information.—These statistics are based upon replies to a question on the bureau's statistical report card sent to all operators, inquiring whether loading machines were used in 1926. All known manufacturers of loading machines were also asked to supply lists of operators to whom sales of machines had been made. From the information obtained from these two sources a complete list of mines using loading machines in 1926 was built up, and a special inquiry was then sent by the bureau to each mine on the list. The results are incorporated in Table 36, which is believed to be as complete as a survey of this kind can be made. The assistance of all those who have contributed information is gratefully acknowledged.

What the figures include.—The discussion of "mechanization" now going on in the American bituminous coal industry refers to a wide variety of mechanical devices designed to reduce the labor of hand shoveling into mine cars, and to facilitate the work of transporting the coal from the point where it is shot down to the point where it is delivered to the rail transportation system of the mine. Various classification of these devices have been proposed. In Table 36 only those devices are included that make possible loading most of the coal handled without hand shoveling. The table therefore covers loading machines; combined cutting and loading machines; scraper loaders; shaking-trough conveyors, equipped with a shovel attachment at the front end such as the so-called "duckbill"; conveyors equipped with a cutting device; and also certain "self-loading" conveyors designed to receive the coal as shot down. Strictly speaking, "self-loading" conveyors are not loading machines, but they are stated to load out from one-third to a half or even two-thirds of the coal without hand shoveling, and they have therefore been included in the table.

Hand-loading conveyors and mine-car loaders not included.—The table does not, however, cover other face conveyors and mine-car loaders on which practically all the coal has to be shoveled by hand. It should be remembered, however, that such hand-loading devices reduce the height to which the coal has to be lifted by the miner and in consequence greatly reduce the labor of hand shoveling. Complete statistics covering the use of hand-loaded face conveyors in 1926 are not available, but the information at hand indicates a considerable number of installations of this type, particularly in central Pennsylvania. Statistics of mine-car loaders, of which the Jeffrey pit-car loader is the principal type, have been collected by the bureau for 1926 but can not be published without disclosing the business of individual manufacturers. It may be said, however, that mine-car loaders have been widely introduced, especially in Illinois. From the information available it appears that the total quantity of coal handled by mine-car loaders and hand-loaded face conveyors in 1926 was over a million tons. Added to the 10,022,195 tons loaded by machines this gives a grand total of more than 11,000,000 tons produced by "mechanized" mining in 1926.

Stripping operations not included.—The figures in the table relate only to deep mines. In connection with the growing mechanization of underground operations, however, it is of interest to refer to the development of surface stripping. In 1926 there were 237 strip pits in the bituminous coal fields, and these pits employed 410 power shovels and produced by stripping 16,922,695 tons of coal. (See Coal in 1926, p. 487.)

Types of machines in 1926.—A recapitulation by type of machine of the total of 10,022,195 tons mechanically loaded is given at the foot of Table 36. By far the largest group, both in numbers installed and tonnage handled, were mobile loading machines, of the digging and loading or cutting and loading types. A total of 295 such machines loaded 7,786,360 tons in 1926. The second largest group comprised the scraper loaders, which handled 1,554,372 tons. A third group comprised various types of combination conveyor loaders, including, as already explained, shaking-trough conveyors equipped with "duckbills," and two makes of "self-loading" conveyors. This group handled 681,463 tons in 1926. It would be desirable to make a further division of this group and show separate figures for the "self-loading" conveyors, on account of marked differences in design and operation, but this can not be done without disclosing the business of individual manufacturers.

The recapitulation by type of machine is given because the scrapers and combined conveyor-loader types perform certain work in gathering and transporting as well as in loading the coal. The selection of a particular type depends largely on natural conditions in the mine, and consequently the distribution of the types varies widely from State to State. It can not be shown by individual States, however, without disclosing individual operations.

Total coal produced at mines using loading machines.—Of the 131 mines that used mechanical loaders in 1926 there were 13 in which the process of mechanization had so far advanced that 90 per cent or more of the mine output was loaded mechanically. In 55 of the mines, on the other hand, the proportion loaded mechanically was still less than 10 per cent. For the entire group of 131 mines the proportion loaded mechanically was 24.9 per cent, the total output of these mines including coal loaded in workings still operated by hand being 40,329,133 tons. In certain States the proportion was much higher. The 7 machine-loading mines of Wyoming loaded 63.6 per cent of their production mechanically, and the 13 mines of Indiana loaded 89.4 per cent mechanically.

Per cent of State output machine loaded.—The coal mechanically loaded in 1926 was 1.8 per cent of the total production of all bituminous mines in the country. In some States, however, a considerable part of the output was loaded by machine. Thus, in Utah the proportion was 2.6 per cent of the State production; in Illinois, 2.9 per cent; in Virginia, 7.7 per cent; in Indiana, 9.3 per cent; and in Wyoming, 17.6 per cent.

Rank of States and districts in tonnage, machine loaded.—The map of Figure 6 shows the distribution by States and counties of the 10,022,000 tons loaded mechanically during the year. In any county from which operators reported tonnage loaded by machine there is at least one black dot, no matter how small the quantity. A larger number of dots indicates a larger tonnage loaded mechanically, so that the relative importance of the several States and districts can be gauged by the relative number of dots.

There are two principal impressions one derives from this map. The first is the far-flung character of mechanical loading even up to the end of 1926, when 17 States had made practical use of loading machines. The other impression is the relative concentration of the tonnage loaded by machine in four principal districts. The first one is the Pocahontas field, including not only McDowell County, W. Va., but the extension into Tazewell County on the Virginia side. The second is the State of Indiana, which in total tons loaded led all other States in 1926. It should be noted that the total of 2,166,737 tons for Indiana includes a large quantity handled by scrapers. The third district is southern Illinois. You will notice that the large development in Illinois has been confined almost exclusively to the southern part of the State. The fourth is the State of Wyoming, where there is active development not only along the Union Pacific but also in the Sheridan district to the north. Wyoming has the distinction of leading all other States in the percentage of its total output that is loaded mechanically. Outside these four major districts marked progress had also been made up to the end of 1926 in southwestern Virginia; in central Pennsylvania; in the Pittsburgh district, including there the tonnage loaded by the so-called self-loading conveyors; and in Utah.

Comparisons with 1925.—In Coal in 1925, pages 456 to 458, the bureau published statistics of loading machines used underground for the three years 1923 to 1925. These figures showed a total of 1,879,726 tons loaded by machines in 1923, of 3,495,522 tons in 1924, and of 6,243,104 tons in 1925. From 1923 to 1924 the increase in the quantity handled by machine was thus 86 per cent, and from 1924 to 1925 it was 79 per cent.

In order to compare 1925 and 1926 it is necessary to revise the figures for 1925 as originally published to conform with certain changes in classification adopted in 1926. The revision consists of excluding pit-car loaders and including "self-loading" conveyors, and at the same time certain operations have been added in Indiana for which the bureau had formerly no definite information. With this revision, the following tabular statement showing the increase in the tonnage mechanically loaded in each State is entirely comparable.

State	1925 (revised)	1926	Increase	
			Net tons	Per cent
	Net tons	*Net tons*		
Illinois	905,473	2,035,521	1,130,048	124.8
Indiana	1,510,167	2,166,737	656,570	43.5
Iowa	18,200	84,325	66,125	363.3
Kentucky	157,862	181,763	23,901	15.1
Pennsylvania	217,435	855,578	638,143	293.5
West Virginia and Virginia	2,692,998	3,087,116	394,118	14.6
Wyoming	470,672	1,142,304	671,632	142.7
Other States	175,149	468,851	293,702	167.7
	6,147,956	10,022,195	3,874,239	63.0

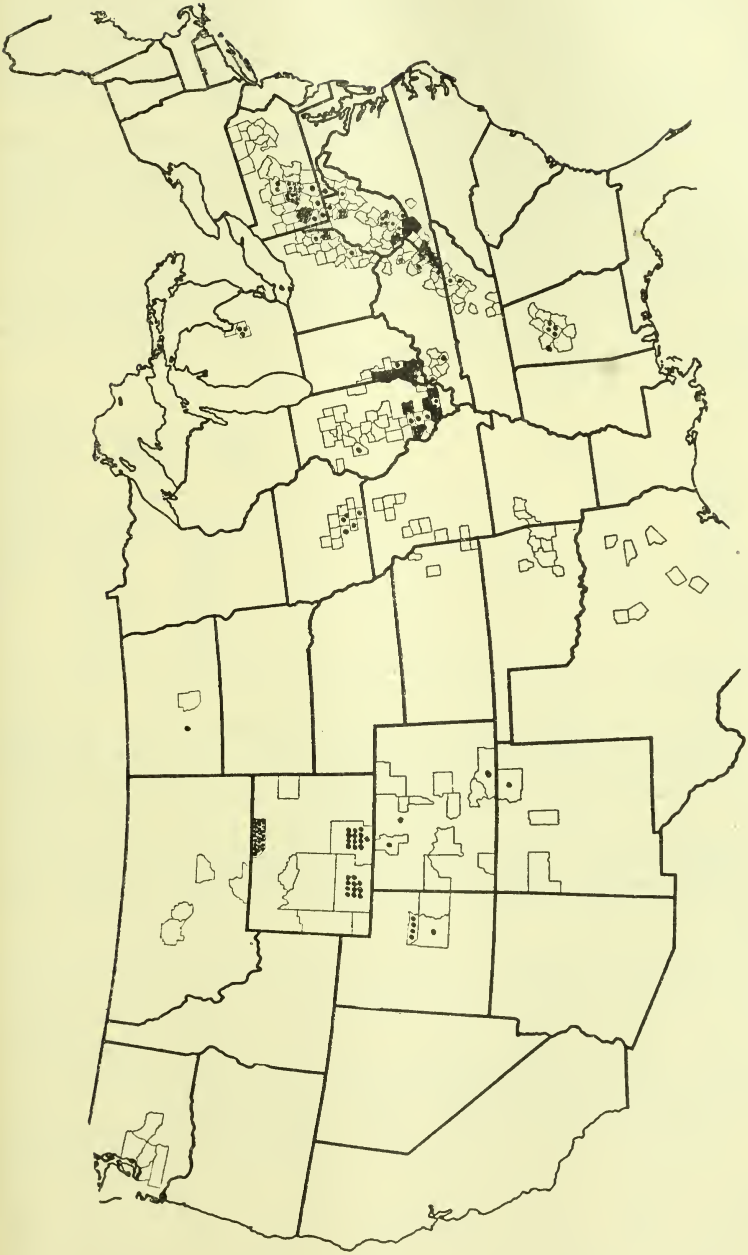

FIGURE 6.—Geographic distribution of the tonnage of bituminous coal loaded by machine. The map shows in outline all the important coal-producing counties of the country. In any county from which operators reported tonnage loaded by machine in 1926 there is at least one black dot, no matter how small the quantity. A larger number of dots indicates a larger tonnage, and in some cases the number of dots is so great that the county appears as solid black

It will be seen that for the country as a whole the increase from 1925 to 1926 was 63 per cent. In the two Virginias, which are combined to avoid disclosing individual operations for 1925, and in Kentucky the increase was about 15 per cent. In the territory north of the Ohio it was very much larger. For Indiana the increase amounted to 44 per cent; for Illinois, 125 per cent; for Wyoming, 143 per cent; for Iowa, 363 per cent; and for the group of "Other States," most of which are in the North, it was 168 per cent.

Output per man per machine.—Great interest attaches to the effect of the use of mechanical loading on the output per man. It is too early to give out statistics of the tonnage per man shift in the mechanized mines, for the reason that the possibilities of mechanized mining if introduced into an entirely new mine are not known.

There can, however, be shown the average tonnage per man employed for the entire year. The following statement compares the output per man employed above or below ground in the machine-loading mines and in the hand-loading mines of the same State in 1926:

State	Machine-loading mines	Other underground mines	Difference in favor of machine-loading mines
	Net tons	*Net tons*	*Net tons*
Illinois	1,260	852	+408
Indiana	1,431	852	+579
Ohio	1,269	665	+604
Pennsylvania	1,120	983	+137
Virginia	1,316	960	+356
West Virginia	1,299	1,202	+97
Wyoming	1,684	976	+708
United States total	1,216	963	+253

In Illinois, for example, the machine-loading mines averaged 1,260 tons per worker employed during 1926. The hand-loading mines in the same State, not including the stripping operations, averaged only 852 tons. This is an excess in favor of the machine-loading mines of 408 tons, or practically 50 per cent. In computing these figures surface workers have been included, so that the excess shown by the machine-loading mines is in spite of any increase in top workers which the introduction of mechanical loading may have made advisable.

In Indiana the average for the machine-loading mines was 1,431 tons per man, and for the hand-loading mines it was 852 tons per man, with a similar excess of 579 tons in favor of the machine-loading operations. For the entire group of machine-loading mines in the country, as a whole the average performance per man employed was 1,216 tons, as against 963 tons in the hand-loading mines.

Further great interest attaches to the figures of output per machine shift. On this point the data collected by the bureau are not complete, because a number of the operators to whom the questionnaire was sent did not have accurate records of the number of machine shifts operated in 1926. It can be stated, however, that for all of the mobile loading machines (not including scrapers or conveyors) for which data were obtained the average per shift was 134 tons in 1926 and that for all of the scrapers of various types for which data were obtained the average tonnage per shift was 65. No doubt the experience of 1927 and 1928 will very greatly increase these average tonnages per shift. The data for the mobile loading machines include entry drivers of the McKinlay type, which tend to bring down the average per shift slightly, since they are in narrow places exclusively.

Comparative working time of machine and hand loading mines.—A question often asked is "Does mechanical loading pay?" There is a general feeling in the industry that it would be premature to give out data on relative costs of production under machine and hand loading methods. Certainly, the Bureau of Mines has no data of that character, nor will it attempt to obtain any. There is indirect evidence, however, that in comparison with the hand-loading mines, the machine-loading mines are doing relatively well. This indirect evidence is the average number of days that the machine-loading mines succeed in working in comparison with the hand-loading mines in the same State, shown for 1926 in the following statement:

State	Machine-loading mines	Other underground mines	Difference in favor of machine-loading mines
	Days	*Days*	*Days*
Illinois	225	168	+57
Indiana	226	167	+59
Ohio	251	155	+96
Pennsylvania	245	224	+21
Virginia	292	256	+36
West Virginia	265	246	+19
Wyoming	193	178	+15
United States total	246	216	+30

In Illinois in 1926 the machine-loading mines succeeded in working 225 days, while the hand-loading mines averaged only 168 days, a difference in favor of the machine-loading operations of 57 days. Much the same difference was shown in practically every other State. The average for the United States was 246 days for the machine-loading operations, as against 216 for the hand-loading operations, an excess in favor of machine loading of 30 days.

There are obviously several factors involved in the steadier working time of the machine-loading mines. One is the probability that the mines in which machine loading has first been introduced had natural conditions that would tend to give them low costs and competitive advantages, even if they had been using hand loading. There is also the fact that some of the large machine operations happen to be "captive mines" and have a better chance to place their output.

Even allowing for these other explanations it is a remarkable fact that in practically every district the machine-loading mines were running more steadily than their hand-loading competitors. That was true at least in 1926.

TABLE 36.—*Mechanical loading underground in bituminous coal mines in 1926*

[The table covers all devices by which most of coal handled is loaded without hand shoveling. It does not cover mine-car loaders and conveyors on which all the coal has to be shoveled by hand, although it should be remembered that such devices, by reducing the height to which the miner must lift the coal, greatly reduce the labor of hand shoveling]

	Mines that reported loading by machine						Other mines, reporting loading machines but not tonnage [1]	
	Number of mines	Number of loading machines	Net tons loaded by machine	Total production of these mines		Per cent of total output loaded by machine	Mines	Machines
				Net tons, including hand loading	Per cent loaded by machine			
By States:								
Alabama	3	30	111,803	458,455	24.4	0.5	1	(2)
Colorado	3	(2)	(2)	(2)	(2)	(2)	2	(2)
Illinois	18	107	2,035,521	8,050,665	25.3	2.9	1	(2)
Indiana	13	87	2,166,737	2,423,681	89.4	9.3	------	------
Iowa	6	8	84,325	949,732	8.9	1.8	1	(2)
Kentucky	10	20	181,763	4,288,921	4.2	.3	5	5
Maryland	1	(2)	(2)	(2)	(2)	(2)	------	------
Michigan	2	(2)	(2)	(2)	(2)	(2)	------	------
New Mexico	1	(2)	(2)	(2)	(2)	(2)	------	------
North Dakota	1	(2)	(2)	(2)	(2)	(2)	------	------
Ohio	3	10	122,576	1,303,590	9.4	.4	2	(2)
Pennsylvania	20	48	855,578	5,512,447	15.5	.6	4	5
Tennessee	2	(2)	(2)	(2)	(2)	(2)	2	(2)
Utah	6	8	114,619	1,214,530	9.4	2.6	1	(2)
Virginia	6	17	1,086,480	3,391,417	32.0	7.7	2	(2)
West Virginia	29	57	2,000,636	9,354,888	21.4	1.4	12	18
Wyoming	7	44	1,142,304	1,796,396	63.6	17.6	------	------
Undistributed	------	19	119,853	1,584,411	7.6	.5	------	15
	131	455	10,022,195	40,329,133	24.9	1.8	33	43
By methods:								
Scraper loaders	50	133	1,554,372	40,329,133	24.9	.3	13	16
Shaking-shovel and "self-loading" conveyors [3]	10	27	681,463			.1	------	------
Other loaders [4]	71	295	7,786,360			1.4	20	27
	131	455	10,022,195	40,329,133	24.9	1.8	33	43

[1] In practically all of these the use of loading machines was in the experimental stage only.

[2] Included under "Undistributed" to avoid disclosing individual operations.

[3] Includes shaking-trough conveyors equipped with shovel attachment on front end (so-called "duck-bills"), on which reports indicated 60 to 90 per cent loaded without hand shoveling, and also 2 makes of long-face conveyors designed to receive coal as shot down, on which a large part of the coal (sometimes more than half) is loaded without hand shoveling. These types can not be shown separately without disclosing individual operations.

[4] Includes mobile digging and loading machines and cutting and loading machines.

SCREENING AND SIZING

A special study of sizing of bituminous coal was made in 1927. The results are presented in Figure 7 and in Tables 37 and 38. The scope and method of the study are discussed in detail in an article by H. O. Rogers and F. G. Tryon, published in Coal Age, January, 1929, pages 30 to 32. No complete statistics of sizes of bituminous coal have hitherto been available, although sample data covering part of the year 1917 were published on pages 97 and 98, Technical Publication 156, American Institute of Mining and Metallurgical Engineers, 1928.

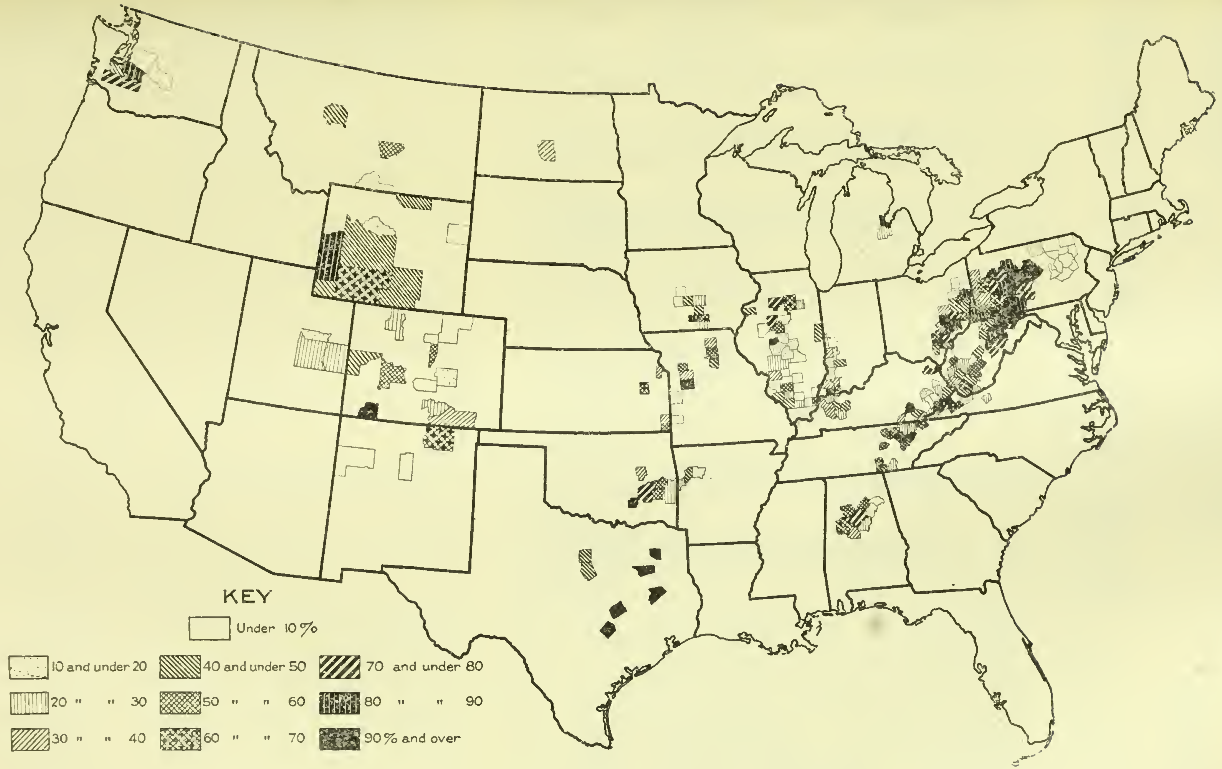
KEY
Under 10%
10 and under 20
20 " " 30
30 " " 40
40 and under 50
50 " " 60
60 " " 70
70 and under 80
80 " " 90
90% and over

FIGURE 7.—Per cent of run-of-mine in the total shipments from each county in 1927. The map covers the coal-mining counties that produce as much as 100,000 tons a year. Counties in which the demand for house fuel is relatively large show a low percentage of run-of-mine and appear on the map as white or very lightly shaded. Counties that produce little house coal show a high percentage of run-of-mine and appear heavily shaded or black. For the country as a whole shipments of bituminous in 1927 consisted of 50 per cent run-of-mine, 29 per cent prepared sizes, and 21 per cent screenings or slack

TABLE 37.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—summary by States*

State	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
Alabama	11,487	3,113	4,236	18,836	45	18,881	61.0	16.5	22.5
Alaska	--------	--------	--------	--------	98	98	--------	--------	--------
Arkansas	224	802	232	1,258	257	1,515	17.8	63.8	18.4
California, Idaho, Nevada, and Oregon	--------	6	2	8	13	21	--------	75.0	25.0
Colorado	2,087	3,424	3,015	8,526	17	8,543	24.5	40.2	35.3
Georgia	3	20	49	72	--------	72	4.2	27.8	68.0
Illinois	9,171	21,262	12,136	42,569	189	42,758	21.5	50.0	28.5
Indiana	4,742	7,273	4,234	16,249	505	16,754	29.2	44.8	26.0
Iowa	839	816	321	1,976	171	2,147	42.5	41.3	16.2
Kansas	1,151	884	985	3,020	8	3,028	38.1	29.3	32.6
Kentucky	21,565	27,380	18,045	66,990	590	67,580	32.2	40.9	26.9
Maryland	2,331	96	150	2,577	117	2,694	90.5	3.7	5.8
Michigan	250	314	133	697	--------	697	35.9	45.0	19.1
Missouri	610	1,188	584	2,382	219	2,601	25.6	49.9	24.5
Montana	1,531	869	333	2,733	231	2,964	56.0	31.8	12.2
New Mexico	1,295	981	547	2,823	--------	2,823	45.9	34.8	19.3
North Carolina	49	--------	--------	49	--------	49	100.0	--------	--------
North Dakota	114	876	173	1,163	50	1,213	9.8	75.3	14.9
Ohio	7,119	3,447	1,854	12,420	724	13,144	57.3	27.8	14.9
Oklahoma	1,884	869	508	3,261	437	3,698	57.8	26.6	15.6
Pennsylvania	90,728	14,792	10,227	115,747	278	116,025	78.4	12.8	8.8
South Dakota	--------	--------	--------	--------	3	3	--------	--------	--------
Tennessee	2,964	1,454	850	5,268	155	5,423	56.3	27.6	16.1
Texas	1,196	81	11	1,288	--------	1,288	92.9	6.3	.8
Utah	581	2,516	1,467	4,564	--------	4,564	12.7	55.1	32.2
Virginia	6,476	3,412	2,280	12,168	66	12,234	53.2	28.0	18.8
Washington	1,160	315	384	1,859	576	2,435	62.4	16.9	20.7
West Virginia	64,775	41,279	33,199	139,253	1,283	140,536	46.5	29.6	23.9
Wyoming	3,725	1,658	1,050	6,433	2	6,435	57.9	25.8	16.3
	238,057	139,127	97,005	474,189	6,034	480,223	50.2	29.3	20.5

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*

ALABAMA

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
Bibb	476	344	387	1, 207	--------	1, 207	39. 4	28. 5	32. 1
Blount	194	158	--------	352	--------	352	55. 1	44. 9	--------
Etowah and St. Clair	--------	64	698	762	1	763	--------	8. 4	91. 6
Fayette and Marion	--------	132	110	242	--------	242	--------	54. 6	45. 4
Jefferson	6, 669	442	1, 636	8, 747	--------	8, 747	76. 2	5. 1	18. 7
Shelby	129	392	163	684	--------	684	18. 9	57. 3	23. 8
Tuscaloosa	461	113	180	754	--------	754	61. 1	15. 0	23. 9
Walker	3, 558	1, 468	1, 062	6, 088	42	6, 130	58. 5	24. 1	17. 4
Winston	--------	--------	--------	--------	2	2	--------	--------	--------
	11, 487	3, 113	4, 236	18, 836	45	18, 881	61. 0	16. 5	22. 5

ARKANSAS

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Franklin	106	121	38	265	8	273	40. 0	45. 7	14. 3
Johnson	9	157	56	222	62	284	4. 1	70. 7	25. 2
Logan	--------	157	2	159	18	177	--------	98. 7	1. 3
Pope and Scott	3	59	11	73	11	84	4. 1	80. 8	15. 1
Sebastian	106	308	125	539	158	697	19. 7	57. 1	23. 2
	224	802	232	1, 258	257	1, 515	17. 8	63. 8	18. 4

CALIFORNIA, IDAHO, NEVADA, AND OREGON

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Total	--------	6	2	8	13	21	--------	75. 0	25. 0

COLORADO

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Boulder	32	178	132	342	--------	342	9. 4	52. 0	38. 6
Delta	5	40	14	59	--------	59	8. 5	67. 8	23. 7
El Paso	21	78	76	175	--------	175	12. 0	44. 6	43. 4
Fremont	24	227	107	358	2	360	6. 7	63. 4	29. 9
Garfield	10	--------	--------	10	--------	10	100. 0	--------	--------
Gunnison	278	181	60	519	11	530	53. 6	34. 9	11. 5
Huerfano	433	872	469	1, 774	1	1, 775	24. 4	49. 2	26. 4
Jefferson	24	8	12	44	--------	44	54. 5	18. 2	27. 3
La Plata	30	2	1	33	--------	33	90. 9	6. 1	3. 0
Las Animas	966	489	1, 334	2, 789	2	2, 791	34. 7	17. 5	47. 8
Mesa	35	35	13	83	--------	83	42. 2	42. 2	15. 6
Montezuma	--------	--------	--------	--------	1	1	--------	--------	--------
Routt	116	553	196	865	--------	865	13. 4	63. 9	22. 7
Weld	110	718	583	1, 411	--------	1, 411	7. 8	50. 9	41. 3
Other counties (Elbert, Jackson, and Pitkin)	3	43	18	64	--------	64	4. 7	67. 2	28. 1
	2, 087	3, 424	3, 015	8, 526	17	8, 543	24. 5	40. 2	35. 3

GEORGIA

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Total	3	20	49	72	--------	72	4. 2	27. 8	68. 0

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*—Continued

ILLINOIS

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
Bond, Clinton, and Marion	121	707	570	1,398	--------	1,398	8.7	50.6	40.7
Bureau	64	21	5	90	--------	90	71.1	23.3	5.6
Christian	491	1,231	818	2,540	--------	2,540	19.3	48.5	32.2
Edgar, Logan, and Macon	20	67	31	118	--------	118	16.9	56.8	26.3
Franklin	956	5,949	3,234	10,139	--------	10,139	9.4	58.7	31.9
Fulton	113	846	414	1,373	6	1,379	8.2	61.6	30.2
Gallatin	10	4	4	18	--------	18	55.6	22.2	22.2
Grundy	70	90	76	236	--------	236	29.7	38.1	32.2
Henry	7	25	12	44	--------	44	15.9	56.8	27.3
Jackson	444	255	259	958	--------	958	46.4	26.6	27.0
Jefferson and White	6	42	35	83	--------	83	7.2	50.6	42.2
Knox	68	8	9	85	--------	85	80.0	9.4	10.6
La Salle	90	21	20	131	--------	131	68.7	16.0	15.3
McLean, Will, and Woodford	--------	43	18	61	--------	61	--------	70.5	29.5
Macoupin	840	1,794	539	3,173	--------	3,173	26.5	56.5	17.0
Madison	697	756	549	2,002	5	2,007	34.8	37.8	27.4
Menard	10	--------	--------	10	4	14	100.0	--------	--------
Mercer	16	14	6	36	--------	36	44.4	38.9	16.7
Montgomery	273	477	244	994	--------	994	27.5	48.0	24.5
Peoria	536	151	24	711	7	718	75.4	21.2	3.4
Perry	365	730	405	1,500	--------	1,500	24.3	48.7	27.0
Randolph	250	272	69	591	--------	591	42.3	46.0	11.7
St. Clair	529	1,419	720	2,668	9	2,677	19.8	53.2	27.0
Saline	534	1,455	1,033	3,022	16	3,038	17.7	48.1	34.2
Sangamon	326	1,696	865	2,887	96	2,983	11.3	58.7	30.0
Shelby	--------	11	4	15	--------	15	--------	73.3	26.7
Tazewell	167	93	46	306	--------	306	54.6	30.4	15.0
Vermilion	970	775	607	2,352	3	2,355	41.2	33.0	25.8
Washington	125	61	26	212	10	222	59.0	28.8	12.2
Williamson	1,073	2,249	1,494	4,816	33	4,849	22.3	46.7	31.0
	9,171	21,262	12,136	42,569	189	42,758	21.5	50.0	28.5

INDIANA

Clay	135	363	184	682	14	696	19.8	53.2	27.0
Daviess	--------	--------	--------	--------	36	36	--------	--------	--------
Gibson	348	372	274	994	--------	994	35.0	37.4	27.6
Greene	483	383	212	1,078	--------	1,078	44.8	35.5	19.7
Knox	205	700	331	1,236	--------	1,236	16.6	56.6	26.8
Owen	17	--------	--------	17	2	19	100.0	--------	--------
Perry, Spencer, and Vanderburg	198	3	30	231	--------	231	85.7	1.3	13.0
Pike	842	1,149	665	2,656	--------	2,656	31.7	43.3	25.0
Sullivan	634	1,714	957	3,305	134	3,439	19.2	51.9	28.9
Vermilion	187	1,045	628	1,860	--------	1,860	10.1	56.2	33.7
Vigo	1,016	1,375	799	3,190	99	3,289	31.8	43.1	25.1
Warrick	677	169	154	1,000	220	1,220	67.7	16.9	15.4
	4,742	7,273	4,234	16,249	505	16,754	29.2	44.8	26.0

IOWA

Appanoose	60	166	6	232	28	260	25.9	71.6	2.5
Boone	19	120	58	197	19	216	9.6	60.9	29.5
Dallas	1	119	60	180	80	260	.6	66.1	33.3
Jasper	1	2	1	4	1	5	25.0	50.0	25.0
Lucas and Page	147	11	16	174	--------	174	84.5	6.3	9.2
Mahaska	--------	--------	--------	--------	1	1	--------	--------	--------
Marion	182	151	81	414	17	431	44.0	36.5	19.5
Monroe	280	93	38	411	--------	411	68.1	22.6	9.3
Polk	105	104	36	245	12	257	42.9	42.4	14.7
Taylor	--------	--------	--------	--------	11	11	--------	--------	--------
Van Buren	3	3	1	7	--------	7	42.9	42.9	14.2
Wapello	--------	--------	--------	--------	1	1	--------	--------	--------
Warren	41	47	24	112	--------	112	36.6	42.0	21.4
Wayne	--------	--------	--------	--------	1	1	--------	--------	--------
	839	816	321	1,976	171	2,147	42.5	41.3	16.2

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*—Continued

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
KANSAS									
Bourbon		5		5		5		100.0	
Cherokee	469	207	159	835	2	837	56.2	24.8	19.0
Crawford	629	619	790	2,038	6	2,044	30.9	30.4	38.7
Franklin and Leavenworth	19	16	15	50		50	38.0	32.0	30.0
Linn	1	20	21	42		42	2.4	47.6	50.0
Osage	33	17		50		50	66.0	34.0	
	1,151	884	985	3,020	8	3,028	38.1	29.3	32.6
KENTUCKY									
Eastern district:									
Bell	1,103	1,194	876	3,173	22	3,195	34.8	37.6	27.6
Boyd	24			24		24	100.0		
Breathitt	16	54	27	97	3	100	16.5	55.7	27.8
Carter	25	7	2	34	34	68	73.5	20.6	5.9
Clay	50	27	18	95	14	109	52.6	28.4	19.0
Floyd	1,385	2,205	1,567	5,157	24	5,181	26.9	42.8	30.3
Harlan	2,822	5,259	5,288	13,369	5	13,374	21.1	39.3	39.6
Johnson	28	799	356	1,183		1,183	2.4	67.5	30.1
Knott	317	140	118	575		575	55.2	24.3	20.5
Knox	134	105	67	306	14	320	43.8	34.3	21.9
Laurel	92			92	37	129	100.0		
Lawrence, Magoffin, and Morgan	109	75	44	228		228	47.8	32.9	19.3
Lee					30	30			
Letcher	3,772	1,749	795	6,316		6,316	59.7	27.7	12.6
McCreary	354	420	177	951	27	978	37.2	44.2	18.6
Martin	78	260	227	565		565	13.8	46.0	40.2
Perry	526	3,826	1,905	6,257	16	6,273	8.4	61.1	30.5
Pike	3,710	1,948	1,902	7,560	72	7,632	49.1	25.8	25.1
Whitley	40	343	222	605	17	622	6.6	56.7	36.7
	14,585	18,411	13,591	46,587	315	46,902	31.3	39.5	29.2
Western district:									
Crittenden and Hancock	13			13		13	100.0		
Daviess	56	12	8	76	17	93	73.7	15.8	10.5
Henderson	70	174	88	332	75	407	21.1	52.4	26.5
Hopkins	2,584	3,187	1,561	7,332	19	7,351	35.2	43.5	21.3
McLean	48	52	18	118		118	40.7	44.1	15.2
Muhlenberg	1,810	3,050	1,384	6,244	52	6,296	29.0	48.8	22.2
Ohio	704	475	264	1,443		1,443	48.8	32.9	18.3
Union	493	572	417	1,482	64	1,546	33.3	38.6	28.1
Webster	1,202	1,447	714	3,363	48	3,411	35.8	43.0	21.2
	6,980	8,969	4,454	20,403	275	20,678	34.2	44.0	21.8
Total, all Kentucky	21,565	27,380	18,045	66,990	590	67,580	32.2	40.9	26.9
MARYLAND									
Allegany	1,701	93	139	1,933	36	1,969	88.0	4.8	7.2
Garrett	630	3	11	644	81	725	97.8	.5	1.7
	2,331	96	150	2,577	117	2,694	90.5	3.7	5.8

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*—Continued

MICHIGAN

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
Bay	108	5	16	129	--------	129	83.7	3.9	12.4
Midland and Saginaw	142	309	117	568	--------	568	25.0	54.4	20.6
	250	314	133	697	--------	697	35.9	45.0	19.1

MISSOURI

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Adair	58	64	28	150	3	153	38.7	42.7	18.6
Barton	99	583	371	1,053	49	1,102	9.4	55.4	35.2
Bates	23	103	45	171	37	208	13.5	60.2	26.3
Caldwell	--------	--------	--------	--------	8	8	--------	--------	--------
Cedar and Vernon	--------	63	51	114	8	122	--------	55.3	44.7
Chariton and Howard	--------	--------	--------	--------	54	54	--------	--------	--------
Clay	9	20	15	44	--------	44	20.5	45.5	34.0
Grundy and Harrison	5	--------	--------	5	--------	5	100.0	--------	--------
Henry	65	78	47	190	--------	190	34.2	41.1	24.7
Johnson	54	--------	--------	54	--------	54	100.0	--------	--------
Lafayette	55	94	--------	149	--------	149	36.9	63.1	--------
Linn	--------	--------	--------	--------	8	8	--------	--------	--------
Macon	30	19	9	58	2	60	51.7	32.8	15.5
Putnam	6	--------	--------	6	3	9	100.0	--------	--------
Ralls	13	--------	--------	13	--------	13	100.0	--------	--------
Randolph	57	68	17	142	--------	142	40.1	47.9	12.0
Ray	136	96	1	233	39	272	58.4	41.2	.4
Schuyler	--------	--------	--------	--------	8	8	--------	--------	--------
	610	1,188	584	2,382	219	2,601	25.6	49.9	24.5

MONTANA

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Carbon	68	448	140	656	174	830	10.4	68.3	21.3
Cascade	43	14	30	87	53	140	49.4	16.1	34.5
Musselshell	599	390	155	1,144	--------	1,144	52.4	34.1	13.5
Rosebud	821	--------	--------	821	--------	821	100.0	--------	--------
Other counties (Blaine, Chouteau, Daniels, Dawson, Hill, Judith Basin, Pondera, Richland, Toole, and Wibaux)	--------	17	8	25	4	29	--------	68.0	32.0
	1,531	869	333	2,733	231	2,964	56.0	31.8	12.2

NEW MEXICO

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Colfax	1,214	427	173	1,814	--------	1,814	66.9	23.5	9.6
McKinley	63	452	234	749	--------	749	8.4	60.3	31.3
Rio Arriba	13	1	--------	14	--------	14	92.9	7.1	--------
Other counties (Lincoln, Sandoval, Santa Fe, and Socorro)	5	101	140	246	--------	246	2.0	41.1	56.9
	1,295	981	547	2,823	--------	2,823	45.9	34.8	19.3

NORTH CAROLINA

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Chatham	35	--------	--------	35	--------	35	100.0	--------	--------
Lee	14	--------	--------	14	--------	14	100.0	--------	--------
	49	--------	--------	49	--------	49	100.0	--------	--------

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*—Continued

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
NORTH DAKOTA (LIGNITE)									
Adams	14	18	9	41	--------	41	34.1	43.9	22.0
Bowman	5	28	4	37	--------	37	13.5	75.5	11.0
Burke	2	273	8	283	1	284	.7	96.5	2.8
Burleigh	81	72	60	213	1	214	38.0	33.8	28.2
Divide	1	--------	--------	1	10	11	100.0	--------	--------
Grant	--------	--------	--------	--------	1	1	--------	--------	--------
Hettinger	--------	1	--------	1	12	13	100.0	--------	--------
McLean	2	51	--------	53	24	77	3.8	96.2	--------
Mercer	1	300	86	387	--------	387	.3	77.5	22.2
Morton	--------	15	--------	15	--------	15	--------	100.0	--------
Stark	6	17	3	26	--------	26	23.1	65.4	11.5
Ward	--------	88	3	91	--------	91	--------	96.7	3.3
Williams	2	13	--------	15	1	16	13.3	86.7	--------
	114	876	173	1,163	50	1,213	9.8	75.3	14.9
OHIO									
Athens	693	154	68	915	145	1,060	75.7	16.8	7.5
Belmont	2,073	615	352	3,040	272	3,312	68.2	20.2	11.6
Carroll	147	48	30	225	72	297	65.3	21.3	13.4
Columbiana	122	13	3	138	77	215	88.4	9.4	2.2
Coshocton	32	32	27	91	38	129	35.2	35.2	29.6
Guernsey	371	89	49	509	50	559	72.9	17.5	9.6
Harrison	931	641	362	1,934	--------	1,934	48.1	33.1	18.8
Hocking	195	65	23	283	--------	283	68.9	23.0	8.1
Jackson	25	15	14	54	18	72	46.3	27.8	25.9
Jefferson	1,110	721	419	2,250	42	2,292	49.3	32.0	18.7
Meigs	448	405	203	1,056	--------	1,056	42.4	38.4	19.2
Morgan, Noble, Scioto, and Washington	229	38	17	284	--------	284	80.6	13.4	6.0
Muskingum	145	2	1	148	--------	148	98.0	1.4	.6
Perry	296	329	119	744	--------	744	39.8	44.2	16.0
Portage	--------	6	2	8	--------	8	--------	75.0	25.0
Stark	17	75	35	127	1	128	13.4	59.0	27.6
Tuscarawas	234	199	130	563	5	568	41.6	35.3	23.1
Vinton	51	--------	--------	51	4	55	100.0	--------	--------
	7,119	3,447	1,854	12,420	724	13,144	57.3	27.8	14.9
OKLAHOMA									
Coal	116	5	--------	121	--------	121	95.9	4.1	--------
Latimer	169	85	53	307	57	364	55.0	27.7	17.3
Le Flore	89	118	97	304	114	418	29.3	38.8	31.9
Okmulgee	287	336	189	812	50	862	35.3	41.4	23.3
Pittsburg	786	152	74	1,012	179	1,191	77.7	15.0	7.3
Rogers	118	--------	--------	118	--------	118	100.0	--------	--------
Tulsa	129	72	15	216	37	253	59.7	33.3	7.0
Other counties (Haskell, Mayes, Muskogee, and Wagoner)	190	101	80	371	--------	371	51.2	27.2	21.6
	1,884	869	508	3,261	437	3,698	57.8	26.6	15.6

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*—Continued

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
PENNSYLVANIA (BITUMINOUS)									
Allegheny	2,869	3,102	2,108	8,079	25	8,104	35.5	38.4	26.1
Armstrong	4,150	739	549	5,438	--------	5,438	76.3	13.6	10.1
Beaver	62	49	49	160	--------	160	38.8	30.6	30.6
Bedford	365	28	45	438	--------	438	83.3	6.4	10.3
Blair and Fulton	175	20	31	226	--------	226	77.4	8.9	13.7
Bradford and Lycoming	15	4	17	36	--------	36	41.7	11.1	47.2
Butler	1,131	356	242	1,729	9	1,738	65.4	20.6	14.0
Cambria	11,657	119	311	12,087	--------	12,087	96.4	1.0	2.6
Center	892	1	--------	893	--------	893	100.0	--------	--------
Clarion	1,242	38	19	1,299	--------	1,299	95.7	2.9	1.4
Clearfield	4,085	68	76	4,229	4	4,233	96.5	1.6	1.9
Clinton	223	--------	--------	223	--------	223	100.0	--------	--------
Elk	623	71	43	737	--------	737	84.5	9.6	5.9
Fayette	21,040	1,235	926	23,201	--------	23,201	90.7	5.3	4.0
Greene	5,757	501	408	6,666	--------	6,666	86.4	7.5	6.1
Huntingdon	222	28	57	307	--------	307	72.3	9.1	18.6
Indiana	7,489	648	672	8,809	--------	8,809	85.0	7.4	7.6
Jefferson	1,651	417	134	2,202	7	2,209	75.0	18.9	6.1
Lawrence	66	108	37	211	--------	211	31.3	51.2	17.5
McKean and Venango	4	--------	--------	4	--------	4	100.0	--------	--------
Mercer	94	137	52	283	--------	283	33.2	48.4	18.4
Somerset	9,432	189	309	9,930	--------	9,930	95.0	1.9	3.1
Tioga	18	40	48	106	--------	106	17.0	37.7	45.3
Washington	6,131	3,322	1,977	11,430	233	11,663	53.6	29.1	17.3
Westmoreland	11,335	3,572	2,117	17,024	--------	17,024	66.6	21.0	12.4
	90,728	14,792	10,227	115,747	278	116,025	78.4	12.8	8.8
SOUTH DAKOTA (LIGNITE)									
Dewey	--------	--------	--------	--------	2	2	--------	--------	--------
Meade and Ziebach	--------	--------	--------	--------	1	1	--------	--------	--------
	--------	--------	--------	--------	3	3	--------	--------	--------
TENNESSEE									
Anderson	865	79	52	996	--------	996	86.8	7.9	5.3
Campbell	206	448	292	946	102	1,048	21.8	47.4	30.8
Claiborne	630	222	165	1,017	--------	1,017	61.9	21.8	16.3
Fentress	265	166	49	480	--------	480	55.2	34.6	10.2
Grundy	225	102	26	353	--------	353	63.7	28.9	7.4
Hamilton	41	16	107	164	--------	164	25.0	9.8	65.2
Marion	88	48	83	219	34	253	40.2	21.9	37.9
Morgan	259	26	16	301	--------	301	86.0	8.6	5.4
Scott	45	55	55	155	--------	155	29.0	35.5	35.5
Other counties (Cumberland, Overton, Putnam, Rhea, Roane, Sequatchie, and White)	340	292	5	637	19	656	53.4	45.8	.8
	2,964	1,454	850	5,268	155	5,423	56.3	27.6	16.1
TEXAS									
Bituminous: Erath, Palo Pinto, Webb, and Wise	72	69	10	151	--------	151	47.7	45.7	6.6
Lignite: Anderson, Bastrop, Bexar, Henderson, Hopkins, Houston, Leon, Medina, Milam, Nacogdoches, Shelby, Titus, and Wood	1,124	12	1	1,137	--------	1,137	98.9	1.1	--------
	1,196	81	11	1,288	--------	1,288	92.9	6.3	.8

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*—Continued

UTAH

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
Carbon	438	2,222	1,354	4,014	--------	4,014	10.9	55.4	33.7
Emery	106	189	81	376	--------	376	28.2	50.3	21.5
Other counties (Grand, Iron, Summit, and Uintah)	37	105	32	174	--------	174	21.3	60.3	18.4
	581	2,516	1,467	4,564	--------	4,564	12.7	55.1	32.2

VIRGINIA

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Dickenson	844	63	138	1,045	--------	1,045	80.8	6.0	13.2
Lee	318	1,037	749	2,104	66	2,170	15.1	49.3	35.6
Montgomery	--------	55	38	93	--------	93	--------	59.1	40.9
Russell	973	286	240	1,499	--------	1,499	64.9	19.1	16.0
Tazewell	240	1,364	631	2,235	--------	2,235	10.7	61.0	28.3
Wise	4,087	573	466	5,126	--------	5,126	79.7	11.2	9.1
Other counties (Pulaski and Scott)	14	34	18	66	--------	66	21.2	51.5	27.3
	6,476	3,412	2,280	12,168	66	12,234	53.2	28.0	18.8

WASHINGTON

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
King	1	34	30	65	355	420	1.5	52.3	46.2
Kittitas	855	138	166	1,159	--------	1,159	73.8	11.9	14.3
Lewis	2	28	5	35	11	46	5.7	80.0	14.3
Pierce	58	2	5	65	210	275	89.2	3.1	7.7
Other counties (Cowlitz, Thurston, and Whatcom)	244	113	178	535	--------	535	45.6	21.1	33.3
	1,160	315	384	1,859	576	2,435	62.4	16.9	20.7

WEST VIRGINIA

County	Run-of-mine	Prepared sizes	Screenings or slack	Total	Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
Barbour	2,351	229	255	2,835	21	2,856	82.9	8.1	9.0
Boone	1,607	1,391	882	3,880	46	3,926	41.4	35.9	22.7
Braxton	69	49	54	172	85	257	40.1	28.5	31.4
Brooke	699	215	117	1,031	33	1,064	67.8	20.9	11.3
Clay	12	661	275	948	13	961	1.3	69.7	29.0
Fayette	6,769	2,583	2,602	11,954	135	12,089	56.6	21.6	21.8
Gilmer	51	85	30	166	--------	166	30.7	51.2	18.1
Greenbrier	1,253	90	206	1,549	--------	1,549	80.9	5.8	13.3
Harrison	4,025	3,693	1,298	9,016	76	9,092	44.6	41.0	14.4
Kanawha	1,705	3,454	2,289	7,448	311	7,759	22.9	46.4	30.7
Lewis	9	--------	--------	9	8	17	100.0	--------	--------
Lincoln	61	135	78	274	46	320	22.2	49.2	28.6
Logan	7,854	8,239	6,571	22,664	63	22,727	34.7	36.4	28.9
McDowell	9,173	5,133	6,530	20,836	73	20,909	44.0	24.6	31.4
Marion	3,088	3,834	1,618	8,540	13	8,553	36.2	44.9	18.9
Marshall	1,304	559	369	2,232	--------	2,232	58.4	25.1	16.5
Mason	--------	20	--------	20	--------	20	--------	100.0	--------
Mercer	1,170	1,410	1,431	4,011	53	4,064	29.2	35.2	35.6
Mineral	212	35	49	296	27	323	71.6	11.8	16.6
Mingo	2,328	2,108	1,582	6,018	9	6,027	38.7	35.0	26.3
Monongalia	4,280	2,596	1,802	8,678	153	8,831	49.3	29.9	20.8
Nicholas	68	23	23	114	37	151	59.6	20.2	20.2
Ohio	1,870	41	371	2,282	30	2,312	81.9	1.8	16.3
Preston	1,805	--------	--------	1,805	--------	1,805	100.0	--------	--------
Putnam	212	131	65	408	--------	408	52.0	32.1	15.9
Raleigh	7,302	3,594	3,855	14,751	--------	14,751	49.5	24.4	26.1
Randolph	419	44	67	530	--------	530	79.1	8.3	12.6
Taylor	1,094	399	127	1,620	--------	1,620	67.6	24.6	7.8
Tucker	973	23	15	1,011	5	1,016	96.2	2.3	1.5
Upshur	744	54	32	830	26	856	89.6	6.5	3.9
Webster	44	--------	--------	44	--------	44	100.0	--------	--------
Wyoming	1,942	364	553	2,859	--------	2,859	67.9	12.7	19.4
Other counties (Grant, Summers, and Wayne)	282	87	53	422	20	442	66.8	20.6	12.6
	64,775	41,279	33,199	139,253	1,283	140,536	46.5	29.6	23.9

TABLE 38.—*Shipments of run-of-mine, prepared sizes, and screenings or slack from bituminous coal mines in 1927—details by counties*—Continued

WYOMING

County	Shipments (thousands of net tons)						Per cent of total (excluding unspecified)		
	Sizes specified				Sizes unspecified	Grand total	Run-of-mine	Prepared sizes	Screenings or slack
	Run-of-mine	Prepared sizes	Screenings or slack	Total					
Campbell, Converse, Johnson, and Weston	8	63	52	123	2	125	6. 5	51. 2	42. 3
Carbon, Fremont, Teton, and Uinta	283	140	146	569	--------	569	49. 7	24. 6	25. 7
Hot Springs	2	305	176	483	--------	483	. 4	63. 1	36. 5
Lincoln	929	111	57	1, 097	--------	1, 097	84. 7	10. 1	5. 2
Sheridan	407	355	138	900	--------	900	45. 2	35. 5	15. 3
Sweetwater	2, 096	684	481	3, 261	--------	3, 261	64. 3	21. 0	14. 7
	3, 725	1, 658	1, 050	6, 433	2	6, 435	57. 9	25. 8	16. 3

CLEANING BY WET AND DRY METHODS

Statistics on the cleaning of bituminous coal by wet washing have been published in previous reports of this series (see Coal in 1923, pp. 588–590) and are continued through the year 1927 in Tables 39 and 40. The rapid development of parallel systems of cleaning by dry methods led the bureau to make a special survey of the quantity of bituminous coal cleaned by pneumatic or other mechanical dry methods in 1927, the results of which are given in Table 41. Additional details are given in a special article by F. G. Tryon and H. O. Rogers to be published elsewhere.

TABLE 39.—*Bituminous coal cleaned at the mines by wet washing methods, 1906–1927*

[Note that pneumatic cleaning operations are not included. See Table 41]

Year	Coal washed (net tons)	Cleaned coal (net tons)	Refuse (net tons)	Percentage of cleaned coal to total output
1906	10, 425, 455	9, 251, 946	1, 173, 509	2. 7
1907	12, 981, 514	11, 269, 518	1, 711, 996	2. 9
1908	13, 660, 478	11, 870, 438	1, 790, 040	3. 6
1909	16, 541, 874	14, 443, 147	2, 098, 727	3. 8
1910	18, 395, 382	16, 035, 387	2, 359, 995	3. 8
1911	(1)	(1)	(1)	(1)
1912	19, 844, 517	17, 538, 572	2, 305, 945	3. 9
1913	25, 051, 801	22, 069, 691	2, 982, 110	4. 6
1914	22, 848, 647	20, 264, 141	2, 584, 506	4. 8
1915	23, 472, 036	20, 873, 727	2, 598, 309	4. 7
1916	25, 632, 974	22, 922, 218	2, 710, 756	4. 6
1917	28, 587, 137	25, 483, 696	3, 103, 441	4. 6
1918	25, 119, 548	22, 017, 293	3, 102, 255	3. 8
1919	19, 187, 837	16, 884, 062	2, 303, 775	3. 6
1920	20, 595, 750	17, 984, 289	2, 611, 461	3. 2
1921	15, 355, 169	13, 628, 724	1, 726, 445	3. 3
1922	(2)	(2)	(2)	(2)
1923	22, 364, 986	20, 140, 385	2, 224, 601	3. 6
1924–1926	(2)	(2)	(2)	(2)
1927	23, 566, 642	21, 119, 441	2, 447, 201	4. 1

[1] The returns for 1911 were apparently incomplete, but the error can not now be corrected. As published they showed 12,355,716 tons washed and 10,830,823 tons of cleaned coal, equivalent to 2.7 per cent of the total output.

[2] Canvass not made.

TABLE 40.—*Bituminous coal cleaned at the mines by wet washing methods in 1927, by States* [1]

[Note that pneumatic cleaning operations are not included. See Table 41]

State	Coal washed (net tons)	Cleaned coal (net tons)	Refuse (net tons)	Percentage of cleaned coal to total State output
Alabama	14, 581, 373	13, 153, 643	1, 427, 730	66. 5
Arkansas	10, 278	9, 250	1, 028	. 6
Colorado	575, 225	494, 607	80, 618	5. 1
Illinois	645, 973	560, 642	85, 331	1. 2
Indiana	201, 515	176, 923	24, 592	1. 0
Kentucky	342, 044	309, 262	32, 782	. 4
Michigan	174, 216	155, 190	19, 026	20. 5
Montana	157, 082	142, 802	14, 280	4. 5
Ohio	7, 989	7, 278	711	. 05
Pennsylvania	2, 274, 668	2, 106, 695	167, 973	1. 6
Tennessee	397, 668	344, 562	53, 106	6. 0
Virginia	1, 362, 363	1, 209, 531	152, 832	9. 4
Washington	1, 042, 786	820, 481	222, 305	31. 1
West Virginia	1, 793, 462	1, 628, 575	164, 887	1. 1
	23, 566, 642	21, 119, 441	2, 447, 201	4. 1

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[1] In addition to the coal washed at the mines, between 2,000,000 and 3,000,000 tons was cleaned by wet methods at washeries in Colorado and Pennsylvania operated by consumers at the point of use.

TABLE 41.—*Bituminous coal cleaned at the mines by pneumatic or other mechanical dry methods in 1927*

State	Number of mines equipped with pneumatic cleaning plants	Total production of these mines (net tons)	Cleaned coal obtained from these mines		Percentage of air-cleaned coal to total State output
			Net tons	Per cent of product of these mines	
Pennsylvania	9	2, 080, 289	1, 464, 766	70. 4	1. 1
West Virginia	13	3, 855, 737	2, 026, 848	52. 2	1. 4
Indiana	1	428, 099	158, 970	37. 1	. 5
New Mexico	1				
Oklahoma	1				
Virginia	1				
	26	6, 364, 125	3, 650, 584	57. 4	. 7

NUMBER AND SIZE OF MINES

TABLE 42.—*Number and production of commercial bituminous coal mines, by size classes, in 1927*

[No canvass of wagon mines was made]

State	Class 1A (more than 500,000 tons)					Class 1B (200,000 to 500,000 tons)					Class 2 (100,000 to 200,000 tons)					Class 3 (50,000 to 100,000 tons)				
	Mines		Production			Mines		Production			Mines		Production			Mines		Production		
	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent
Alabama	4	1.7	3,049,274	762,319	15.4	21	9.1	5,683,402	270,638	28.8	37	16.0	5,312,838	143,590	26.9	46	19.9	3,595,706	78,168	18.2
Alaska	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Arizona	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Arkansas	------	------	------	------	------	------	------	------	------	------	1	1.2	135,048	135,048	8.7	7	8.4	550,013	78,573	35.5
California, Idaho Nevada and Oregon	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Colorado	------	------	------	------	------	11	4.8	3,332,131	203,921	34.3	21	9.2	3,013,091	143,481	31.0	29	12.7	1,971,032	67,967	20.3
Georgia	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1	100.0	76,712	76,712	100.0
Illinois	21	3.9	15,312,794	729,181	32.7	52	9.5	17,214,998	331,058	36.7	52	9.5	7,683,881	147,767	16.4	46	8.4	3,475,035	75,544	7.4
Indiana	2	1.0	1,065,891	532,946	6.0	26	12.6	7,238,760	278,414	40.4	35	16.9	5,227,096	149,346	29.1	37	17.9	2,791,505	75,446	15.5
Iowa	------	------	------	------	------	------	------	------	------	------	5	2.7	818,794	163,759	27.8	12	6.6	880,285	73,357	29.8
Kansas	------	------	------	------	------	------	------	------	------	------	10	4.3	1,169,399	116,940	33.9	9	3.8	612,898	68,100	17.8
Kentucky:																				
Eastern	9	1.9	6,670,631	741,181	13.9	63	13.3	17,923,739	284,504	37.4	90	19.1	12,679,242	140,880	26.5	92	19.5	6,645,553	72,234	13.9
Western	2	1.2	1,169,912	584,956	5.5	41	25.3	11,876,171	289,663	56.0	37	22.8	5,444,969	147,161	25.7	22	13.6	1,643,319	74,696	7.8
Maryland	------	------	------	------	------	2	2.3	440,041	220,021	15.6	6	7.1	767,503	127,917	27.3	11	12.9	819,428	74,493	29.1
Michigan	------	------	------	------	------	------	------	------	------	------	4	50.0	647,334	161,834	85.5	1	12.5	86,890	86,890	11.5
Missouri	------	------	------	------	------	------	------	------	------	------	4	1.8	523,070	130,768	17.1	12	5.4	845,098	70,425	27.6
Montana	2	3.3	1,447,693	723,847	46.1	2	3.3	755,188	377,594	24.0	2	3.3	323,540	161,770	10.3	4	6.7	337,218	84,305	10.7
New Mexico	------	------	------	------	------	5	13.5	1,487,279	297,456	50.6	7	19.0	839,658	119,951	28.6	6	16.2	466,237	77,706	15.9
North Carolina	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
North Dakota	------	------	------	------	------	2	1.3	461,563	230,782	30.2	3	2.0	437,712	145,904	28.7	2	1.3	145,185	72,593	9.5
Ohio	------	------	------	------	------	9	1.5	2,120,024	235,558	3.4	34	5.7	4,599,893	135,291	29.1	57	9.5	4,051,250	71,075	25.7
Oklahoma	------	------	------	------	------	1	.9	271,449	271,449	7.1	6	5.5	807,955	134,659	21.2	21	19.3	1,431,423	68,163	37.5
Pennsylvania	47	2.6	35,279,576	750,629	26.6	137	7.5	41,519,221	303,060	31.2	178	9.7	24,227,758	136,111	18.2	213	11.6	14,897,946	69,943	11.2
South Dakota	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Tennessee	------	------	------	------	------	8	8.7	2,068,912	258,614	35.8	14	15.2	1,857,984	132,713	32.1	16	17.4	1,082,549	67,659	18.7
Texas	------	------	------	------	------	1	3.5	309,596	309,596	23.3	1	3.5	109,762	109,762	8.3	6	20.7	450,174	75,029	33.9
Utah	------	------	------	------	------	8	22.2	2,549,398	318,675	53.3	12	33.4	1,806,419	150,535	37.8	4	11.1	325,354	81,339	6.8
Virginia	5	5.0	3,343,299	668,660	25.9	19	19.0	5,467,091	287,742	42.3	14	14.0	2,129,981	152,142	16.5	17	17.0	1,279,434	75,261	9.9
Washington	------	------	------	------	------	4	7.4	1,246,775	311,694	47.3	4	7.4	577,652	144,413	21.9	5	9.3	366,909	73,382	13.9
West Virginia	39	3.4	25,729,632	659,734	17.7	226	19.6	65,264,634	288,782	45.0	224	19.5	31,901,068	142,415	22.0	195	17.0	14,270,413	73,182	9.8
Wyoming	1	1.6	562.445	562,445	8.3	9	14.5	2,792,692	310,299	41.4	17	27.4	2,464,848	144,991	36.5	8	12.9	613,984	76.748	9.1
	132	1.9	93,631,147	709,327	18.1	647	9.2	190,023,064	293,699	36.7	818	11.7	115,506,495	141,206	22.3	879	12.5	63,711,550	72,482	12.3

State	Class 4 (10,000 to 50,000 tons)					Class 5 (less than 10,000 tons)					Total		
	Mines		Production			Mines		Production			Mines	Production (net tons)	
	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent		Total	Average per mine
Alabama	77	33.4	1,978,496	25,695	10.0	46	19.9	146,150	3,177	0.7	231	19,765,866	85,567
Alaska	3	37.5	99,509	33,170	95.4	5	62.5	4,791	958	4.6	8	104,300	13,038
Arizona						4	100.0	4,583	1,146	100.0	4	4,583	1,146
Arkansas	29	35.0	673,705	23,231	43.5	46	55.4	190,068	4,132	12.3	83	1,548,834	18,661
California, Idaho, Nevada, and Oregon	1	25.0	17,603	17,603	63.2	3	75.0	10,238	3,413	36.8	4	27,841	6,960
Colorado	36	15.7	1,064,940	29,582	10.9	132	57.6	342,881	2,598	3.5	229	9,724,075	42,463
Georgia											1	76,712	76,712
Illinois	88	16.2	2,372,003	26,955	5.1	286	52.5	789,513	2,761	1.7	545	46,848,224	85,960
Indiana	57	27.5	1,473,334	25,848	8.2	50	24.1	139,172	2,783	.8	207	17,935,758	86,646
Iowa	41	22.4	885,963	21,609	30.0	125	68.3	364,580	2,917	12.4	183	2,949,622	16,118
Kansas	54	23.0	1,180,818	21,867	34.3	162	68.9	480,647	2,967	14.0	235	3,443,762	14,654
Kentucky:													
Eastern	134	28.4	3,662,530	27,332	7.6	84	17.8	337,713	4,020	.7	472	47,919,408	101,524
Western	38	23.5	982,769	25,862	4.6	22	13.6	87,450	3,975	.4	162	21,204,590	130,893
Maryland	22	25.9	663,214	30,146	23.6	44	51.8	124,656	2,833	4.4	85	2,814,842	33,116
Michigan	1	12.5	12,325	12,325	1.6	2	25.0	10,214	5,107	1.4	8	756,763	94,595
Missouri	56	25.1	1,271,770	22,710	41.5	151	67.7	424,405	2,811	13.8	223	3,064,343	13,741
Montana	9	15.0	191,974	21,330	6.1	41	68.4	88,025	2,147	2.8	60	3,143,638	52,394
New Mexico	3	8.1	90,775	30,258	3.1	16	43.2	51,590	3,224	1.8	37	2,935,539	79,339
North Carolina	2	100.0	53,377	26,689	100.0						2	53,377	26,689
North Dakota	12	7.8	241,577	20,131	15.8	134	87.6	241,902	1,805	15.8	153	1,527,939	9,987
Ohio	168	28.0	3,934,933	23,422	24.9	331	55.3	1,093,597	3,304	6.9	599	15,799,697	26,377
Oklahoma	46	42.2	1,170,671	25,449	30.7	35	32.1	136,556	3,902	3.5	109	3,818,054	35,028
Pennsylvania	592	32.4	14,342,469	24,227	10.8	663	36.2	2,697,669	4,069	2.0	1,830	132,964,639	72,658
South Dakota						19	100.0	12,507	658	100.0	19	12,507	658
Tennessee	23	25.0	659,881	28,690	11.4	31	33.7	114,041	3,679	2.0	92	5,783,367	62,863
Texas	19	65.5	450,646	23,718	34.0	2	6.8	6,207	3,104	.5	29	1,326,385	45,737
Utah	3	8.3	80,731	26,910	1.7	9	25.0	19,578	2,175	.4	36	4,781,480	132,819
Virginia	26	26.0	631,435	24,286	4.9	19	19.0	64,802	3,411	.5	100	12,916,042	129,160
Washington	17	31.5	384,594	22,623	14.6	24	44.4	59,132	2,464	2.3	54	2,635,062	48,797
West Virginia	264	23.0	7,139,487	27,044	4.9	201	17.5	817,213	4,066	.6	1,149	145,122,447	126,303
Wyoming	10	16.2	275,381	27,538	4.1	17	27.4	44,306	2,606	.6	62	6,753,656	108,930
	1,831	26.1	45,986,910	25,116	8.9	2,704	38.6	8,904,186	3,293	1.7	7,011	517,763,352	73,850

TABLE 43.—*Number and yearly output of commercial bituminous coal mines, by size classes, 1905, 1910, 1913, 1917–1927* [1]

[Exclusive of wagon mines]

Year	Class 1 (more than 200,000 tons) [2]	Class 2 (100,000 to 200,000 tons)	Class 3 (50,000 to 100,000 tons)	Class 4 (10,000 to 50,000 tons)	Class 5 (less than 10,000 tons)	Total
Number of mines:						
1905	411	612	808	1,514	1,715	5,060
1910	618	763	960	1,568	1,909	5,818
1913	694	837	959	1,558	1,728	5,776
1917	792	914	1,044	1,996	2,193	6,939
1918	821	929	1,198	2,636	2,735	8,319
1919	550	854	1,181	2,784	3,625	8,994
1920	701	1,031	1,279	3,160	2,750	8,921
1921	482	807	1,003	2,346	3,400	8,038
1922	416	848	1,084	3,139	3,812	9,299
1923	748	935	1,176	2,742	3,730	9,331
1924	646	819	943	2,047	3,131	7,586
1925	714	833	891	1,969	2,737	7,144
1926	823	845	867	1,912	2,730	7,177
1927	779	818	879	1,831	2,704	7,011
Net tons produced:						
1905	126,499,000	85,920,000	57,386,000	38,995,000	6,034,000	314,834,000
1910	191,519,000	107,052,000	68,858,000	42,282,000	6,561,000	416,272,000
1913	241,463,000	118,476,000	69,018,000	42,292,000	6,280,000	477,529,000
1917	285,366,000	129,486,000	74,894,000	51,596,000	8,824,000	550,166,000
1918	281,267,000	131,027,000	87,143,000	67,453,000	11,387,000	578,277,000
1919	174,848,000	120,926,000	84,625,000	71,334,000	13,198,000	464,931,000
1920	237,468,000	142,750,000	90,669,000	82,129,000	10,716,000	563,732,000
1921	162,438,000	115,607,000	71,160,000	56,099,000	10,618,000	415,922,000
1922	131,876,000	117,195,000	77,287,000	77,203,000	15,248,000	418,809,000
1923	265,869,000	130,804,000	84,342,000	68,769,000	13,639,000	563,423,000
1924	237,338,000	115,217,000	67,967,000	52,606,000	10,559,000	483,687,000
1925	279,190,000	117,986,000	64,578,000	48,900,000	9,399,000	520,053,000
1926	333,047,000	120,598,000	62,650,000	47,616,000	9,456,000	573,367,000
1927	283,654,000	115,506,000	63,712,000	45,987,000	8,904,000	517,763,000
Per cent of total number of mines:						
1905	8.1	12.1	16.0	29.9	33.9	100.0
1910	10.6	13.1	16.5	27.0	32.8	100.0
1913	12.0	14.5	16.6	27.0	29.9	100.0
1917	11.4	13.2	15.0	28.8	31.6	100.0
1918	9.8	11.2	14.4	31.7	32.9	100.0
1919	6.1	9.5	13.1	31.0	40.3	100.0
1920	7.9	11.6	14.3	35.4	30.8	100.0
1921	6.0	10.0	12.5	29.2	42.3	100.0
1922	4.5	9.1	11.7	33.7	41.0	100.0
1923	8.0	10.0	12.6	29.4	40.0	100.0
1924	8.5	10.8	12.4	27.0	41.3	100.0
1925	10.0	11.6	12.5	27.6	38.3	100.0
1926	11.5	11.8	12.1	26.6	38.0	100.0
1927	11.1	11.7	12.5	26.1	38.6	100.0
Percent of total tonnage:						
1905	40.2	27.3	18.2	12.4	1.9	100.0
1910	46.0	25.7	16.5	10.2	1.6	100.0
1913	50.6	24.8	14.4	8.9	1.3	100.0
1917	51.9	23.5	13.6	9.4	1.6	100.0
1918	48.6	22.7	15.1	11.6	2.0	100.0
1919	37.6	26.0	18.2	15.4	2.8	100.0
1920	42.1	25.3	16.1	14.6	1.9	100.0
1921	39.1	27.8	17.1	13.5	2.5	100.0
1922	31.5	28.0	18.5	18.4	3.6	100.0
1923	47.2	23.2	15.0	12.2	2.4	100.0
1924	49.0	23.8	14.1	10.9	2.2	100.0
1925	53.7	22.7	12.4	9.4	1.8	100.0
1926	58.1	21.0	10.9	8.3	1.7	100.0
1927	54.8	22.3	12.3	8.9	1.7	100.0

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[1] This table shows mines, not companies, and should not be confused with other tables that include country banks and many wagon mines shipping by rail.

[2] Figures for 1924–1927 include class 1A and 1B.

TABLE 44.—*Number of mines operating and price of bituminous coal, f. o. b. mines, 1913, 1917–1927*

Year	Number of commercial bituminous mines in operation	Total number of bituminous mines in operation, including wagon mines	Average spot price f. o. b. mines (Coal Age)	Average sales realization per ton on all coal f. o. b. mines
1913	5,776	(1)	$1.23	$1.18
1917	6,939	10,634	3.25	2.26
1918	8,319	11,038	[2] 2.58	2.58
1919	8,994	12,409	2.59	2.49
1920	8,921	14,766	5.64	3.75
1921	8,038	(1)	2.55	2.89
1922	9,299	14,150	3.64	3.02
1923	9,331	11,715	2.77	2.68
1924	7,586	(1)	2.08	2.20
1925	7,144	(1)	2.06	2.04
1926	7,177	(1)	2.21	2.06
1927	7,011	(1)	1.99	1.99

(1) Not available.

[2] Price fixed by Fuel Administrator.

VALUE OF COAL PRODUCED

DEFINITION OF VALUES REPORTED

The value given in this report is the amount received at the mines f. o. b. cars minus the selling expense, and the average value per ton is the average amount received, obtained by dividing the total value by the number of tons sold or produced. Coal used at the mines, coal coked by the producing company, and coal used in some other industry by that company—in all, forming a considerable part of the total output—is not sold, and the value placed upon it is either an estimate or the amount at which it is carried on the company's books. Either value is presumably the amount the coal would have brought if it had been sold or the amount other fuel for the purpose stated would have cost if it had been purchased. In other words, the values given represent returns to the operators for coal sold plus the estimated value of that not sold. The value thus fixed is more or less arbitrary and does not necessarily represent the current prices for coal sold commercially. Many mines are owned by consumers who take all or a great part of their output at nominal prices. The output of such "captive mines" was 22.7 per cent of the entire production in 1926. (Coal in 1926, pp. 473–475.) Even where the coal is actually sold large quantities may be moved on "cost plus" contracts that provide for prices below the average spot prices in the field or the average prices received for coal delivered under ordinary contracts. The figures in the following tables, therefore, do not necessarily show prices or even an average of the prices of coal at the mines. Taken over a period of years, however, they do furnish an index to the rise and fall in the value of coal.

The computed "average value per ton" is thus affected by the value placed by the operator upon coal used at the mine but not shipped. In order to ascertain how large an influence the inclusion of this noncommercial coal might have upon the average, the operators were requested for several years to give separate statements of value for coal loaded at the mines for shipment, for sales to local trade, and for mine fuel and coal made into beehive coke.[8] It was found, however, that for practical purposes the average value of all the coal produced may be accepted as a measure of the average value of the coal shipped. The values placed by operators on mine fuel and upon the coal coked were generally somewhat less than the average amounts received for the coal shipped, but the quantities to which these lower values applied were so much smaller than the quantity shipped that they affected the average for all coal produced only slightly.[9]

ESTIMATES OF VALUE INCLUDED IN STATISTICS

If an operator who is known to have produced coal during the year will make no report of the value of his product to the Bureau of Mines, an estimate of the value is included in the total to make it complete. These estimates are based on the average for each county as obtained from all reports of the operators in the county that did specify value.

Of the $1,029,657,000 given as the total value of bituminous coal at the mines in 1927, fully $977,880,000 represents actual reports from the operators and $51,777,000 represents estimates made in the manner just described. The proportion actually reported is thus 95.0 per cent of the total, a proportion so high as to indicate that the results are thoroughly representative for the country as a whole. The percentage actually reported in each of the principal States is shown in Table 45.

TABLE 45.—*Per cent of total value of bituminous coal produced by commercial operators that is represented by actual reports from the operators, by States, in 1927*

State	Per cent	State	Per cent
Alabama	91.5	North Dakota	99.9
Arkansas	90.3	Ohio	98.1
Colorado	91.8	Oklahoma	82.1
Illinois	92.3	Pennsylvania	97.7
Indiana	88.8	Tennessee	99.7
Iowa	76.5	Texas	81.6
Kansas	80.5	Utah	99.9
Kentucky	90.4	Virginia	99.1
Maryland	93.9	Washington	100.0
Michigan	100.0	West Virginia	96.9
Missouri	98.2	Wyoming	99.9
Montana	98.8		
New Mexico	99.9	United States	95.0

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[8] See Coal in 1919-1921, pp. 558-662, which gives details of values for each of these items in each county.
[9] Coal in 1922, p. 546.

TABLE 46.—*Total and average value per net ton of coal at mines, by States, 1923 and 1927*

State	Total			Average per net ton		
	1923	1927	Increase or decrease	1923	1927	Increase or decrease
Alabama	$51, 624, 000	$44, 524, 000	−$7, 100, 000	$2. 52	$2. 25	−$0. 27
Alaska	755, 000	548, 000	−207, 000	6. 30	5. 25	−1. 05
Arizona	--------	6, 000	+6, 000	--------	1. 31	--------
Arkansas	5, 192, 000	5, 393, 000	+201, 000	4. 01	3. 48	−. 53
California, Idaho, and Oregon [1]	79, 000	85, 000	+6, 000	3. 94	3. 05	−. 89
Colorado	33, 299, 000	27, 044, 000	−6, 255, 000	3. 22	2. 78	−. 44
Georgia	327, 000	233, 000	−94, 000	4. 32	3. 04	−1. 28
Illinois	198, 388, 000	101, 356, 000	−97, 032, 000	2. 50	2. 16	−. 34
Indiana	65, 046, 000	36, 381, 000	−28, 665, 000	2. 48	2. 03	−. 45
Iowa	20, 517, 000	9, 304, 000	−11, 213, 000	3. 59	3. 15	−. 44
Kansas	14, 275, 000	9, 648, 000	−4, 627, 000	3. 21	2. 80	−. 41
Kentucky	113, 542, 000	119, 249, 000	+5, 707, 000	2. 54	1. 73	−. 81
Maryland	6, 911, 000	5, 817, 000	−1, 094, 000	3. 02	2. 07	−. 95
Michigan	5, 545, 000	3, 262, 000	−2, 283, 000	4. 73	4. 31	−. 42
Missouri	11, 575, 000	8, 698, 000	−2, 877, 000	3. 40	2. 84	−. 56
Montana	9, 652, 000	7, 403, 000	−2. 249, 000	3. 07	2. 35	−. 72
New Mexico	10, 668, 000	9, 179, 000	−1, 489, 000	3. 66	3. 13	−. 53
North Carolina	132, 000	191. 000	+59, 000	3. 66	3. 58	−. 08
North Dakota	3, 275, 000	2, 604, 000	−671, 000	2. 36	1. 70	−. 66
Ohio	98, 610, 000	30, 376, 000	−68, 234, 000	2. 43	1. 92	−. 51
Oklahoma	10, 874, 000	11, 570, 000	+696, 000	3. 77	3. 03	−. 74
Pennsylvania, bituminous	472, 217, 000	272, 714, 000	−199, 503, 000	2. 75	2. 05	−. 70
South Dakota	25, 000	38, 000	+13, 000	2. 41	3. 04	+. 63
Tennessee	16, 515, 000	10, 645, 000	−5, 870, 000	2. 73	1. 84	−. 89
Texas	2, 162, 000	1, 998, 000	−164, 000	1. 82	1. 51	−. 31
Utah	13, 657, 000	11, 084, 000	−2, 573, 000	2. 89	2. 32	−. 57
Virginia	32, 468, 000	23, 203, 000	−9, 265, 000	2. 76	1. 80	−. 96
Washington	10, 894, 000	9, 222, 000	−1, 672, 000	3. 72	3. 50	−. 22
West Virginia	285, 481, 000	249, 730, 000	−35, 751. 000	2. 65	1. 72	−. 93
Wyoming	20, 916, 000	18, 152, 000	−2, 764. 000	2. 76	2. 69	−. 07
Total bituminous	1, 514, 621, 000	1, 029, 657, 000	−484, 964, 000	2. 68	1. 99	−. 69
Pennsylvania anthracite	506, 787, 000	420, 942, 000	−85, 845, 000	5. 43	5. 26	−. 17
Grand total	2, 021, 408, 000	1, 450, 599, 000	−570, 809, 000	3. 07	2. 43	−. 64

[1] Includes also Nevada in 1927.

AVERAGE VALUE PER TON

TABLE 47.—*Average value per net ton of coal at mines, 1880–1927*

Year	Anthracite [1]	Bituminous	Year	Anthracite [1]	Bituminous	Year	Anthracite [1]	Bituminous
1880	$1. 47	$1. 25	1896	$1. 50	$0. 83	1912	$2. 11	$1. 15
1881	2. 01	1. 12	1897	1. 51	. 81	1913	2. 13	1. 18
1882	2. 01	1. 12	1898	1. 41	. 80	1914	2. 07	1. 17
1883	2. 01	1. 07	1899	1. 46	. 87	1915	2. 07	1. 13
1884	1. 79	. 94	1900	1. 49	1. 04	1916	2. 30	1. 32
1885	2. 00	1. 13	1901	1. 67	1. 05	1917	2. 85	2. 26
1886	1. 95	1. 05	1902	1. 84	1. 12	1918	3. 40	2. 58
1887	2. 01	1. 11	1903	2. 04	1. 24	1919	4. 14	2. 49
1888	1. 91	1. 00	1904	1. 90	1. 10	1920	4. 85	3. 75
1889	1. 44	. 99	1905	1. 83	1. 06	1921	5. 00	2. 89
1890	1. 43	. 99	1906	1. 85	1. 11	1922	5. 01	3. 02
1891	1. 46	. 99	1907	1. 91	1. 14	1923	5. 43	2. 68
1892	1. 57	. 99	1908	1. 90	1. 12	1924	5. 43	2. 20
1893	1. 59	. 96	1909	1. 84	1. 07	1925	5. 30	2. 04
1894	1. 51	. 91	1910	1. 90	1. 12	1926	5. 62	2. 06
1895	1. 41	. 86	1911	1. 94	1. 11	1927	5. 26	1. 99

[1] Averages for anthracite represent amounts per net ton and include all coal produced.

TABLE 48.—*Average value per net ton of coal at mines, by States, 1918–1927*

State	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	
										Average	Increase or decrease from 1926
Alabama	$2.85	$2.96	$3.65	$3.08	$2.34	$2.52	$2.34	$2.12	$2.29	$2.25	−$0.04
Alaska	5.45	5.66	5.83	6.46	5.43	6.30	5.62	4.89	5.26	5.25	−.01
Arkansas	3.67	3.70	4.56	4.37	4.14	4.01	4.06	3.96	3.77	3.48	−.29
California [1]	2.70	3.38	4.36	4.66	3.87	3.94	4.19	4.75	3.67	2.81	−.86
Colorado	2.69	2.78	3.49	3.55	3.16	3.22	3.05	2.94	2.78	2.78	------
Georgia	3.59	3.71	5.00	2.14	4.06	4.32	3.62	3.32	2.89	3.04	+.15
Illinois	2.32	2.30	3.08	2.74	2.89	2.50	2.27	2.19	2.14	2.16	+.02
Indiana	2.29	2.22	3.16	2.57	2.85	2.48	2.16	2.02	1.98	2.03	+.05
Iowa	3.02	3.09	3.94	3.81	3.72	3.59	3.31	3.14	3.07	3.15	+.08
Kansas	2.91	3.05	3.87	3.85	3.66	3.21	3.03	2.88	2.84	2.80	−.04
Kentucky	2.55	2.46	4.11	2.69	3.02	2.54	1.88	1.72	1.74	1.73	−.01
Maryland	2.77	2.73	4.63	3.61	3.37	3.02	2.17	1.97	2.21	2.07	−.14
Michigan	3.83	3.88	4.93	4.87	5.05	4.73	4.33	4.20	4.12	4.31	+.19
Missouri	3.02	3.21	4.16	3.92	3.81	3.40	3.29	3.07	2.98	2.84	−.14
Montana	2.53	2.67	3.16	3.26	3.19	3.07	2.96	2.59	2.46	2.35	−.11
New Mexico	2.68	3.11	3.68	3.91	3.49	3.66	3.51	3.37	3.16	3.13	−.03
North Carolina	4.75	3.84	7.02	5.76	4.94	3.66	3.92	4.34	4.19	3.58	−.61
North Dakota	2.45	2.50	2.87	2.69	2.65	2.36	2.06	1.85	1.74	1.70	−.04
Ohio	2.58	2.22	3.82	2.65	3.23	2.43	2.03	1.93	1.96	1.92	−.04
Oklahoma	3.64	3.83	4.80	4.62	4.11	3.77	3.69	3.30	3.18	3.03	−.15
Oregon	2.81	3.40	4.49	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Pennsylvania, bituminous	2.59	2.42	3.77	2.78	3.11	2.75	2.26	2.10	2.13	2.05	−.08
South Dakota	2.80	3.17	3.60	2.81	2.84	2.41	2.99	2.91	2.91	3.04	+.13
Tennessee	2.83	2.77	4.02	3.35	2.89	2.73	2.13	1.85	1.90	1.84	−.06
Texas	2.63	2.69	3.75	2.64	2.32	1.82	1.50	1.55	1.60	1.51	−.09
Utah	2.71	2.76	3.22	3.35	3.14	2.89	2.69	2.56	2.37	2.32	−.05
Virginia	2.51	2.55	3.99	3.06	2.58	2.76	2.04	1.84	1.92	1.80	−.12
Washington	3.46	3.58	3.88	4.03	3.98	3.72	3.65	3.62	3.61	3.50	−.11
West Virginia	2.56	2.49	4.34	2.84	2.93	2.65	1.82	1.71	1.84	1.72	−.12
Wyoming	2.39	2.60	2.98	3.24	3.04	2.76	2.71	2.79	2.74	2.69	−.05
Total bituminous	2.58	2.49	3.75	2.89	3.02	2.68	2.20	2.04	2.06	1.99	−.07
Pennsylvania anthracite [2]	3.40	4.14	4.85	5.00	5.01	5.43	5.43	5.30	5.62	5.26	−.36

[1] California includes Arizona, 1926 and 1927; Idaho, 1918–1927; Nebraska, 1924; Nevada, 1927; and Oregon, 1921–1927.

[2] These values represent amounts per net ton and include all coal produced.

AVERAGE EXPORT PRICES

TABLE 49.—*Average value per net ton of bituminous coal exported from the United States to Canada and to all other destinations, by months, 1922–1927*

[Computed from records of Bureau of Foreign and Domestic Commerce. Figures represent value at port, including transportation, and are therefore affected by changes in freight rates as well as f. o. b. mine prices. They include, of course, both spot and contract shipments. Data for 1902 to 1918 were published in Coal in 1923, p. 624; data for 1919 in Coal in 1924, p. 507; and data for 1920 and 1921 in Coal in 1925, p. 470]

Month	1922		1923		1924		1925		1926		1927	
	Canada	Overseas and all others	Canada	Overseas and all others	Canada	Overseas and all others	Canada	Overseas and all others	Canada	Overseas and all others	Canada	Overseas and all others
January	$4.34	$5.83	$5.61	$6.00	$4.73	$4.55	$4.31	$4.13	$3.72	$4.42	$4.37	$5.34
February	4.74	5.48	5.80	5.96	4.64	4.49	4.42	4.25	3.84	4.28	4.17	4.52
March	4.68	5.05	5.77	5.75	4.52	4.45	3.98	4.18	3.75	4.16	4.17	4.45
April	4.03	4.88	5.38	5.98	4.40	4.41	3.98	4.11	4.00	4.26	3.89	4.37
May	4.01	4.83	4.70	5.78	4.01	4.47	3.72	4.06	3.74	4.25	3.63	4.36
June	4.55	5.73	4.51	5.18	3.66	4.46	3.85	4.10	3.73	4.28	3.61	4.26
July	4.79	5.33	4.40	5.10	3.68	4.48	3.77	4.06	3.81	4.35	3.62	4.21
August	6.09	5.69	4.35	4.92	3.83	4.37	3.84	4.08	3.85	4.37	3.59	4.22
September	5.99	5.93	4.50	5.04	3.76	4.19	3.61	4.28	3.70	4.49	3.70	4.27
October	5.56	6.22	4.47	4.69	3.91	4.24	3.72	4.23	3.76	4.71	3.62	4.29
November	5.78	5.69	4.39	4.59	4.17	4.32	3.79	4.25	3.90	5.47	3.69	4.34
December	5.72	5.92	4.59	4.45	4.16	4.27	3.77	4.38	4.10	5.51	4.01	4.29
Average	5.30	5.39	4.76	5.30	4.06	4.40	3.84	4.16	3.83	4.79	3.81	4.60

SPOT PRICES

TABLE 50.—*Average spot price and average amount received per ton for bituminous coal, 1906–1927*

Year	Coal Age's average spot price	Average amount received	Difference [1]	Year	Coal Age's average spot price	Average amount received	Difference [1]
1906	$1.21	$1.11	+$0.10	1918	$2.58	$2.58	--------
1907	1.18	1 14	+.04	1919	2.59	2.49	+$0.10
1908	1.05	1.12	−.07	1920	5.64	3.75	+1.89
1909	1.04	1.07	−.03	1921	2.55	2.89	−.34
1910	1.23	1.12	+.11	1922	3.64	3.02	+.62
1911	1.07	1.11	−.04	1923	2.77	2.68	+.09
1912	1.21	1.15	+.06	1924	2.08	2.20	−.12
1913	1.23	1.18	+.05	1925	2.06	2.04	+.02
1914	1.14	1.17	−.03	1926	2.21	2.06	+.15
1915	1.12	1.13	−.01	1927	1.99	1.99	--------
1916	1.85	1.32	+.53				
1917	3.25	2.26	+.99	Average 22 yrs.	2.03	1.84	+.19

[1] A plus sign indicates that the spot price was greater than the average amount received and a minus sign indicates that it was less than the average amount received.

TABLE 51.—*Monthly average spot price of bituminous coal f. o. b. mines, 1908–1927, as published by Coal Age*

[Figures are average of trade-journal quotations on 14 coals representative of nearly 90 per cent of the bituminous output of the United States, weighted, first, with respect to the proportions each of slack, prepared, and run-of-mine normally shipped, and, second, with respect to the tonnage of each normally produced. For 1919 to 1927 the figures are those published currently by Coal Age, based upon the reports of its field correspondents. For 1913 to 1918 they are taken from Prices of Coal and Coke, by C. E. Lesher, published in 1919 as a chapter of Mineral Resources of the United States, 1918, and also separately by the Fuel Administration and the War Industries Board, modified slightly, however, to permit comparison with the postwar quotations. For 1908 to 1912 they are taken from a study by F. G. Tryon and W. F. McKenney, compiled in as nearly the same way as the trade-journal quotations available permit, and representing 12 or 14 coals covered by the later series]

Month	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917
January	$1.09	$1.06	$1.24	$1.16	$1.14	$1.46	$1.21	$1.13	$1.53	$4.15
February	1.07	1.05	1.23	1.11	1.22	1.22	1.16	1.12	1.40	4.18
March	1.05	1.04	1.25	1.08	1.64	1.17	1.17	1.09	1.27	3.89
April	1.05	1.05	1.26	1.06	1.30	1.17	1.16	1.08	1.24	3.21
May	1.03	1.03	1.19	1.05	1.11	1.15	1.16	1.07	1.21	4.14
June	1.03	1.02	1.18	1.05	1.09	1.14	1.12	1.07	1.26	4.00
July	1.02	1.00	1.18	1.03	1.04	1.18	1.12	1.05	1.22	3.17
August	1.04	1.00	1.20	1.02	1.05	1.22	1.13	1.07	1.30	3.24
September	1.06	1.01	1.32	1.03	1.09	1.23	1.11	1.10	1.57	2.02
October	1.05	1.04	1.27	1.04	1.21	1.29	1.13	1.12	2.26	2.02
November	1.05	1.09	1.23	1.09	1.30	1.31	1.10	1.17	3.87	2.48
December	1.04	1.09	1.22	1.09	1.29	1.26	1.11	1.33	4.01	2.48
Average	1.05	1.04	1.23	1.07	1.21	1.23	1.14	1.12	1.85	3.25

Month	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$2.48	$2.57	$2.57	$3.26	$2.25	$4.38	$2.21	$2.10	$2.18	$2.34
February	2.53	2.49	2.58	2.77	2.20	3.59	2.25	2.04	2.09	2.11
March	2.58	2.47	2.58	2.63	2.12	3.20	2.15	1.99	2.01	2.06
April	2.64	2.43	3.85	2.62	2.24	2.84	2.07	1.95	1.92	1.93
May	2.67	2.38	4.59	2.68	3.11	2.68	2.04	1.97	1.93	1.87
June	2.57	2.40	7.18	2.52	3.31	2.56	2.03	1.95	1.90	1.85
July	2.58	2.47	8.24	2.40	4.67	2.40	1.98	1.93	1.91	1.87
August	2.58	2.76	9.51	2.42	6.13	2.39	1.99	2.04	2.00	2.06
September	2.58	2.91	8.52	2.37	5.08	2.46	2.02	2.18	2.15	2.07
October	2.58	3.09	7.78	2.33	4.48	2.28	2.10	2.13	2.70	1.96
November	2.58	2.57	5.87	2.35	4.11	2.25	2.06	2.26	3.19	1.90
December	2.58	2.58	4.38	2.26	4.05	2.18	2.06	2.19	2.53	1.90
Average	2.58	2.59	5.64	2.55	3.64	2.77	2.08	2.06	2.21	1.99

CONSUMPTION OF BITUMINOUS COAL [10]

PROBLEM OF COLLECTING STATISTICS OF CONSUMPTION

In the marketing of most commodities more is known about supply than about demand. This is especially true of bituminous coal. The American coal producer knows how much he ships but seldom keeps a detailed record of the uses to which his coal is put; indeed, if he sells to a wholesaler or retailer he may never know the name of the ultimate consumer. It is therefore impossible to get accurate figures of consumption from the producers. If, on the other hand, one turns to the consumers he finds the task scarcely less difficult, for bituminous coal is purchased in the raw state by a larger number of buyers than any other material of industry. There are in the United States some 90,000 concerns who purchase coal in carload lots.[11] Of these about 38,000 are retail dealers or peddlers who in turn serve not only the millions of farmers and city dwellers but also the hundreds of thousands of consumers that make up "the small steam trade." There are, for example, 290,000 manufacturing establishments in the country, and the majority buy coal from retail dealers in less than carload lots.[12] Because of the great number of consumers absolute accuracy is unattainable with respect to some of the items in the country's coal budget. Certain of the largest items, such as locomotive fuel and coal for the manufacture of coke, can be measured with a high degree of accuracy; but to complete the picture it is necessary to piece together indirect information from many scattered sources, some of which are contradictory.

The first complete analysis of consumption was undertaken by C. E. Lesher and covered 1915.[13] More detailed and accurate studies were made by Lesher, W. T. Thom, jr., and Wayne P. Ellis for the United States Fuel Administration during the World War.[14] The latter studies, which covered 1917 and 1918, were the basis of the allotment and zoning regulations of the Federal Fuel Administrator. They are noteworthy as giving accurate records of the total consumption of coal in each State and include the only measurements ever made of the consumption for domestic purposes.

The present discussion aims (1) to give a typical cross section of consumption under present conditions and (2) to trace the changes in the requirements of the principal groups of consumers over a period long enough to establish the trend and thereby provide some basis for a forecast.

TOTAL ANNUAL CONSUMPTION

Excluding exports and allowing for changes in stocks the annual consumption of bituminous coal in the United States is now about

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[10] The data in this section are taken from special studies by F. G. Tryon and H. O. Rogers and were presented in part at the Second International Conference on Bituminous Coal, Carnegie Institute of Technology, Nov. 22, 1928.

[11] Lesher, C. E., Report of the Distribution Division of the U. S. Fuel Administration, Pt. I; The Distribution of Coal and Coke: 1919, p. 123.

[12] Fourteenth Census of the United States, vol. 8, 1919, p. 14. In addition there were 5,678 power laundries, 2,156 dyeing and cleaning establishments, 5,376 custom sawmills, 10,427 custom gristmills, and 22,361 mines and quarries.

[13] Lesher, C. E., Coal in 1915, Pt. B, Distribution and Consumption: Mineral Resources of the United States, 1915, Pt. II, pp. 433-513.

[14] Lesher, C. E., Coal in 1917, Pt. B, Mineral Resources of the United States, 1917, Pt. II, pp. 1203-1259, and Coal in 1918, Pt. B, Mineral Resources of the United States, 1918, Pt. II, pp. 1315-1373. Lesher, C. E., Report of the Distribution Division of the U. S. Fuel Administration, Pt. I, The Distribution of Coal and Coke, and Pt. III, Statistical Tables.

500,000,000 tons. (See Table 3.) In the last decade it has fluctuated between a minimum of 390,000,000 tons in 1921, a year of acute industrial depression, and a maximum of 533,000,000 in the active year 1926, when the demand was stimulated by a strike of the anthracite miners. In 1927 the consumption was 499,801,000 tons, and in 1928, according to present indications, it was slightly less.

RELATION TO TOTAL ENERGY CONSUMPTION

As the total consumption of energy in the United States is now equivalent to 1,000,000,000 tons of coal, it is seen that bituminous coal furnishes a little over half of the country's total requirements. The relative importance of the other sources is shown in the accompanying diagram. (See fig. 8.)

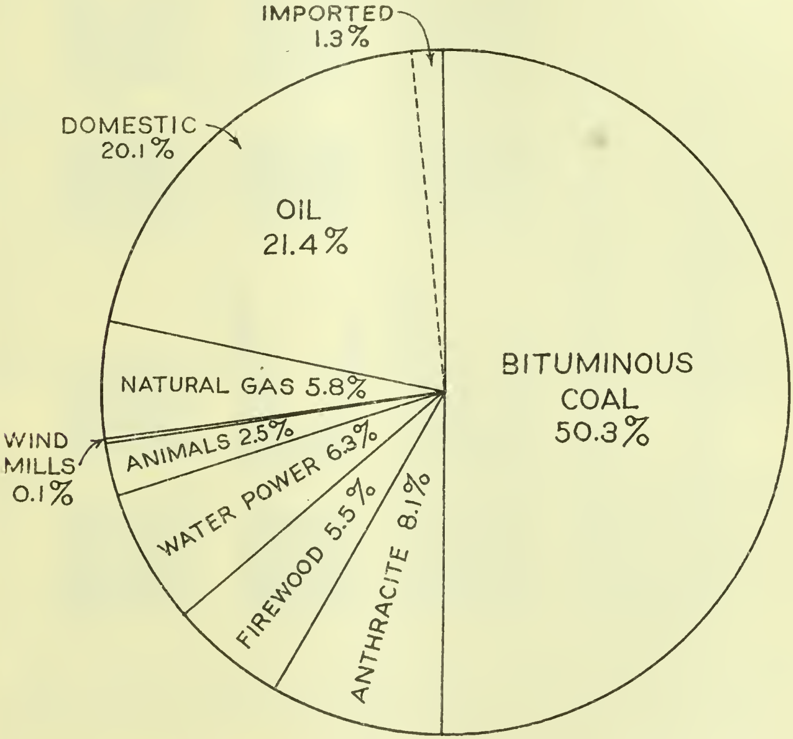

FIGURE 8.—Sources of the energy supply of the United States in 1927, including that derived from work animals, windmills, and firewood

The diagram represents 1927, and as it includes the minor sources of power—work animals, firewood, and windmills—the percentages differ slightly from those in Table 9 and Figure 12. The grand total production of energy during the year was 26,950 trillion B. t. u. In this computation sources other than fuel are represented by the heat units in the fuel that would be required to do the same work. The figures for animal power and firewood are necessarily rough estimates but will indicate the relative importance of the several items.[15]

It will be seen that, including anthracite, coal furnished 58.4 per cent of the total supply. Oil and natural gas now contribute more than one-fourth of the whole. Water power, contrary to popular impression, supplies only a little over 6 per cent. Five and one-half per cent is derived from firewood, which is still widely used in some sections of the country. Work animals, once the dominant source of motive power, now furnish 2.5 per cent.

GEOGRAPHIC CONCENTRATION OF CONSUMPTION

How large a part of the total consumption is concentrated in a few relatively small areas is seldom appreciated. Seventy-three per cent of the bituminous coal is used in the industrialized section north of the Ohio and Potomac Rivers and east of the Mississippi; yet even in this region there are areas of sparse consumption, and the great bulk of the tonnage is consumed in a small number of manufacturing centers, of which Pittsburgh, Chicago, Cleveland, New York and northern New Jersey, Youngstown, Detroit, Buffalo, Johnstown, Philadelphia, Boston, Baltimore, Bethlehem, East St. Louis, and Cincinnati are the most important. Some idea of the high degree of concentration of the industrial demand is conveyed by the fact that 85 of the 3,093 counties in the United States consume 51.8 per cent of the coal required by industry, that is, of the coal consumed by coke ovens, gas plants, iron and steel works, railroad shops, and general manufacturing establishments. The figures cover 1919, but are also representative of present conditions.

SEASONAL CHARACTER OF CONSUMPTION

Even coal men often fail to appreciate fully the seasonal character of the consumption. Figure 9 shows typical fluctuations in the monthly requirements of certain major groups of consumers. In this diagram the daily rate of consumption for each month is represented as an index number, the average for the year being taken as 100. The railroads use more fuel in winter than in summer, partly because of differences in the volume of traffic but chiefly because of larger unit consumption in cold weather. Much the same type of curve is shown by the city gas plants and electric central stations. Even the consumption by general manufacturing industries is greater in winter than in summer because of the large amount of fuel required to heat factory buildings.

The extreme of seasonal fluctuation is shown by the domestic consumption. The deliveries of retail dealers are also sharply seasonal and would be more so were it not for the steadying influence of the small steam trade and the custom followed by many householders of buying their winter's supply during the summer.

The seasonal character of consumption is emphasized because it affects all projects for the processing of coal. In proportion as the demand for the product is seasonal, the load factor is depressed and the burden of storing both the processed fuel and the by-product is increased.

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[15] Tryon, F. G., An Index of Consumption of Fuels and Water Power: Jour. Am. Stat. Assoc., September, 1927, p. 276.

CONSUMPTION BY USES IN A TYPICAL YEAR

A cross section of the demand in a typical year of industrial activity is given in Figure 10 and Table 52. With certain exceptions, which will be referred to later, data are used covering the active year 1926 rather than either 1927 or 1928, which were marked by a slight recession in industrial activity.

By far the largest consumers are the steam railroads, which take 27.7 per cent of the total. This percentage includes not only locomotive coal—amounting to 128,000,000 tons, or 24.7 per cent of the grand total—but also about 15,000,000 tons used for shops, roundhouses, stations, and office buildings.

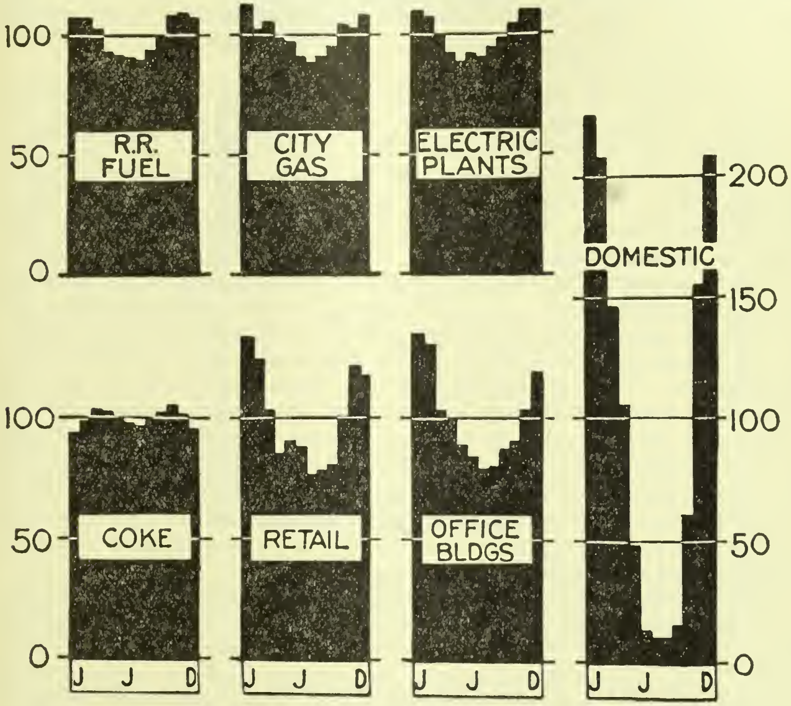

FIGURE 9.—Seasonal variations in the consumption of bituminous coal by seven classes of consumers. The daily rate for each month is represented as an index number, the average for the year being taken as 100. Reproduced from Offseason Purchase and Storage of Railroad Fuel, by F. G. Tryon and W. F. McKenney, International Railway Fuel Association Proceedings, 1924, pp. 215–237.

Next in order rank the coke ovens, which absorb 16 per cent of the total. In 1926 they consumed 82,870,000 tons of coal, of which 63,600,000 tons was charged in by-product ovens. Since 1926, however, many new by-product ovens have been built, and the figure listed as the by-product consumption in Table 52 is 68,870,000 tons, the rate maintained in the first 10 months of 1928. Indeed, during November, 1928, the by-product plants were consuming coal at the rate of 72,000,000 tons a year.[16]

The electric utilities, which rank third in importance, consume less than might be expected because of the high thermal efficiencies that they have now attained. In 1927 their consumption of bituminous coal touched 39,770,000 tons, or 7.7 per cent of the total.

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[16] Tryon, F. G., Rogers, H. O., and Bennit, H. L., Coke and By-Products in 1926: Mineral Resources of the United States, 1926, Pt. II, Bureau of Mines, 1928, pp. 614–615, 618–620; and Monthly Coke Report No. 9, p. 3.

When business conditions are favorable the iron and steel industry consumes about 10,300,000 tons of gas coal and 17,800,000 tons of steam coal, together about 5.4 per cent of the total. This amount covers the requirements of blast furnaces, steelworks, and rolling mills but does not, however, include the coking coal used by the furnaces in the form of coke, which amounts to 59,000,000 tons. Including coal for coking the total requirements of the iron and steel industry when business is active now amount to 88,000,000 tons. Small wonder that the demand for bituminous coal is so greatly affected by the booms and slumps of general business, as recorded in the production of pig iron.

The next item in the table covers the general manufacturing industries, not including coke ovens, steelworks, gas plants, and railroad shops, which are found elsewhere in the table. For this item it is necessary to use 1923, the latest year covered by the Census of Manufactures. Fortunately, 1923 was also a year of marked industrial activity, and the tonnages set down are at least as high as they would be for any subsequent year. The class as a whole consumes, in round numbers, 100,000,000 tons of bituminous coal, or 19.5 per cent of the grand total. In the diagram it is shown broken down into 11 principal groups of industries. Chief in importance is the stone, clay, and glass products group, which accounts for 4.6 per cent of the consumption. This is followed by the metals and metal products (other than steelworks) with 3.5 per cent, by the food products with 2.3 per cent, and so on. It is worth noting that the manufacturing groups consuming the largest tonnages of coal are those in which fuel is required extensively for heating operations. The last group shown is the manufacture of ice, which in 1923 consumed 2,699,000 tons, a quantity destined to shrink as the ice plants purchase more and more of their power from central stations.

The importance of the requirements of coal-gas and water-gas plants is greater than would be indicated by the tonnage consumed, which amounts to 5,263,000 tons, or barely 1 per cent of the total supply. This figure includes only bituminous coal for carbonization in gas retorts or for direct conversion into water gas, both of which uses require coals of special quality.

Other small items are fuel for coal mines, for other mines and quarries, and for ship's bunkers. Each of these accounts for approximately 1 per cent of the total.

There remains a residue designated as "domestic and other purposes," which amounts to 100,000,000 tons, or 19.3 per cent of the grand total. This item is obtained by subtracting the other known items from the known total, the result being checked against all available information as to the magnitude of the uses which it includes. Its largest single element is the demand for domestic purposes, which, according to studies of Lesher and Thom, in 1917 amounted to 57,104,000 tons.[17] Such information on the retail coal trade as is available indicates that since 1917 there has been a decided increase in the bituminous coal used for domestic purposes, but the extent of the increase is not known. It is known that the item of 100,000,000 tons, besides the heating of homes and apartments, includes heating of all large buildings other than factories, such as hotels, stores, offices, theaters, schools, public buildings, garages, service stations, steam laundries, etc. It also includes a number of other items on which accurate data are not available, such as city waterworks, central heating plants, the construction industry, threshing engines, the consumption of the United States Navy, and the requirements of very small industrial consumers, the products of which are valued at less than $5,000 a year and which are therefore not covered by the Census of Manufactures.

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[17] Lesher, C. E., Coal in 1917, Pt. B, Mineral Resources of the United States, 1917, Pt. II, p. 1254.

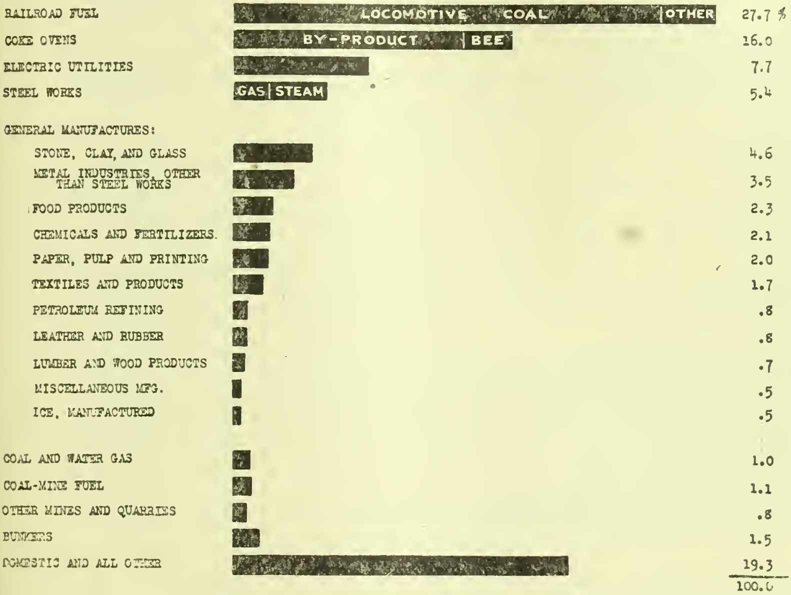

FIGURE 10.—Consumption of bituminous coal by uses in a typical year of industrial activity. Note that the item "Domestic and all other" includes the heating of all large buildings other than factories, such as hotels, apartments, stores, offices, theaters, garages, and service stations, and also a number of nondomestic uses not elsewhere covered, such as waterworks, threshing engines, construction work, power laundries, customs gristmills and sawmills, and small factories whose products are valued at less than $5,000

A further analysis of the requirements for general manufacturing industries is afforded by Table 53, which shows the consumption of the 25 leading individual industries, as reported by the census of 1923.[18]

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[18] Bureau of the Census, Biennial Census of Manufactures: 1923, pp. 1216–1243.

TABLE 52.—*Consumption of bituminous coal by uses in a typical year of industrial activity*

[In general the data cover 1926, the latest year in which general business in the United States was conspicuously active. For general manufacturing, however, it is necessary to use 1923, the latest year covered by the Census of Manufactures, which fortunately was also a year of industrial activity. For certain other groups of consumers, figures for 1927 are used as being more representative than those for 1926. The result, though not agreeing with the total for any single year, is typical of present-day conditions when general business is prosperous]

Item	Year	Net tons consumed	Per cent of total
Railroad fuel (all steam roads): [1]			
Locomotive fuel	1926	127,900,000	24.7
All other (shops, stations, etc.)	1926	15,200,000	3.0
Total	1926	143,100,000	27.7
Coke ovens: [2]			
By-product	1926	68,870,000	13.3
Beehive	1926	14,000,000	2.7
Total	1926	82,870,000	16.0
Electric utilities	1927	39,770,000	7.7
Steelworks: [3]			
Gas coal	1926	10,300,000	2.0
Steam coal	1926	17,800,000	3.4
Total	1926	28,100,000	5.4
General manufacturing: [4]			
Stone, clay, and glass products	1923	24,030,000	4.6
Metals and metal products other than steelworks [5]	1923	18,202,000	3.5
Food products (not including ice)	1923	11,647,000	2.3
Chemicals and fertilizers	1923	10,623,000	2.1
Paper, pulp, and printing	1923	10,481,000	2.0
Textiles and their products	1923	8,846,000	1.7
Petroleum refining	1923	3,890,000	.8
Leather and rubber products	1923	3,915,000	.8
Lumber and wood products	1923	3,673,000	.7
Miscellaneous manufacturing industries	1923	2,755,000	.5
Ice	1923	2,699,000	.5
Total	1923	100,761,000	19.5
Coal gas and water gas [6]	1925	5,263,000	1.0
Coal-mine fuel	1926	5,728,000	1.1
Mines and quarries other than coal	1919	4,190,000	.8
Bunker:			
Foreign	1927	4,581,000	.9
Domestic (incomplete)	1927	2,970,000	.6
Total	1927	7,551,000	1.5
Domestic and all other uses [7]	1926–27	100,000,000	19.3
Grand total	1926–27	517,333,000	100.0

[1] Based on records of Interstate Commerce Commission covering Class I roads. Includes an allowance for Class II and III roads, and switching and terminal companies.

[2] The figure for coke ovens represents the total consumed in the active year 1926, subdivided, however, between beehive and by-product so as to allow for the progress in constructing new by-product ovens in 1927 and 1928.

[3] Estimated from quarterly reports on stocks and consumption to the Bureau of Mines.

[4] Other than steel, coke, gas, and railroad repair shops. From the Census of Manufactures.

[5] Includes motor vehicles.

[6] Bituminous coal used for gas making, not including that charged in by-product ovens operated by city gas companies.

[7] Includes the heating of large buildings other than factories, such as hotels, apartments, stores, offices, theaters, garages, and service stations, and also a number of other items that can not be separated, such as waterworks, construction industry, threshing, U. S. Navy, central heating plants, laundries, and very small industrial consumers not covered by the Census of Manufactures. Because of the inclusion of these items, the total for this group is not comparable with the estimates of consumption for "domestic use" hitherto published.

Table 53.—*Consumption of coal by 25 largest individual industries in the group of general manufacturing plants (other than steel, coke and gas works, and railroad repair shops) in 1923*

[Data from the Census of Manufactures of 1923. The figures include anthracite as well as bituminous coal]

	Net tons
1. Clay products and pottery	10, 635, 000
2. Paper and wood pulp	10, 510, 000
3. Cement	8, 787, 000
4. Chemicals, including coal-tar products	4, 997, 000
5. Petroleum refining	4, 898, 000
6. Foundry and machine shops	4, 302, 000
7. Cotton goods	4, 053, 000
8. Slaughtering and meat packing	3, 922, 000
9. Glass	3, 146, 000
10. Ice, manufactured	2, 896, 000
11. Automobiles, including bodies and parts	2, 629, 000
12. Rubber goods	2, 123, 000
13. Zinc smelting and refining	1, 978, 000
14. Woolen and worsted goods	1, 774, 000
15. Lumber and timber products	1, 625, 000
16. Butter, cheese, and condensed milk	1, 432, 000
17. Electrical machinery, apparatus, and supplies	1, 418, 000
18. Leather, tanned and finished	1, 399, 000
19. Dyeing and finishing textiles	1, 298, 000
20. Glucose and starch	1, 208, 000
21. Bread and other bakery products	1, 177, 000
22. Copper smelting and refining	1, 116, 000
23. Furniture and refrigerators	1, 130, 000
24. Flour-mill and grist-mill products	1, 043, 000
25. Beverages	1, 038, 000
All other (325) industries	20, 227, 000
Total consumed in manufacturing, other than in steel-works, coke and gas plants, and railroad repair shops	100, 761, 000

TREND OF CONSUMPTION SINCE THE WAR

To the practical coal man perhaps the most significant fact about the consumption is that the rapid growth so conspicuous in the period before the World War has been checked. For the 20 years from 1899 to 1919, according to studies of Prof. E. E. Day for the Harvard Economic Service, the production of bituminous coal grew at the average rate of 16,800,000 tons a year. (Coal in 1923, pp. 519–520.) Since then it has shown no increase. The change is brought out graphically in Figure 11. Had the former rate of growth as indicated by pre-war experience and calculated by Day continued after the war the demand in 1927 would have been some 680,000,000 tons. The actual production in that year was 518,000,000 tons. This striking change in the demand came upon the industry at a time when productive facilities were rapidly expanding under the influence of the high prices of fuel in 1917–18, 1920, 1922–23. The combination of increasing mine capacity and arrested demand, as illustrated by the diagram, produced a condition such that readjustment was inevitable. Between 1923 and 1927 a total of 110,000 miners lost their jobs, 2,320 commercial mines were forced to close, and mine capacity was reduced by 135,000,000 tons. The capacity now in operation does not greatly exceed what might have been required had the former rate of increase in demand continued. Actually, because of the checking of demand, the disparity between mine capacity and production is still greater than before the war.

It is therefore a matter of the greatest importance for the bituminous coal industry to study the causes underlying the changing trend of consumption.

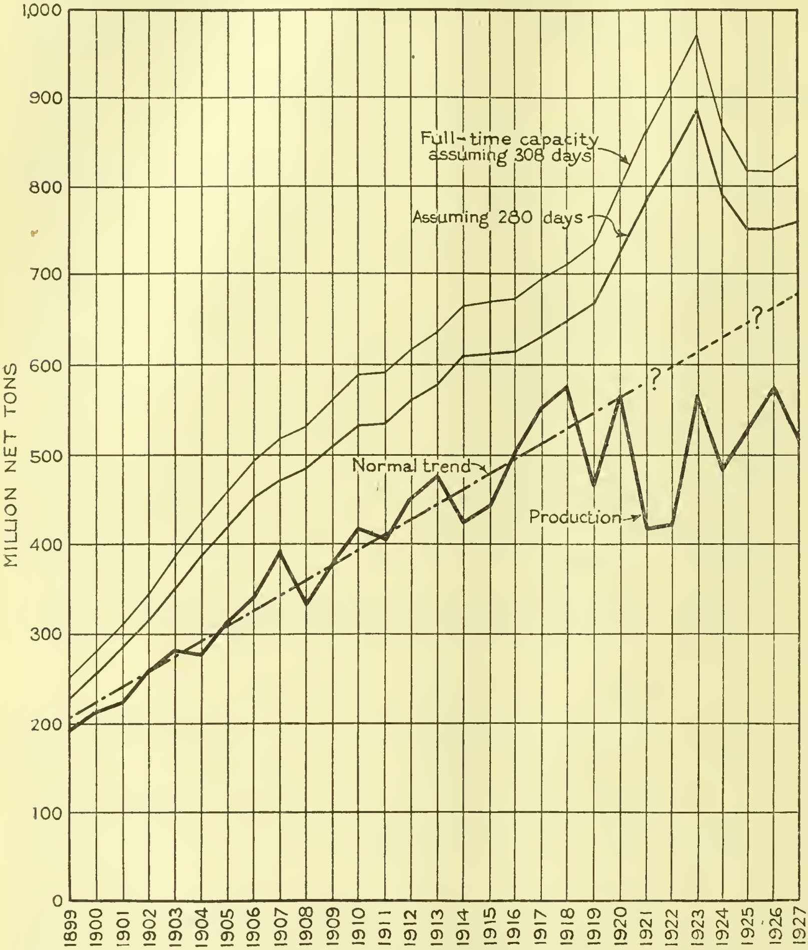

FIGURE 11.—Trend of bituminous coal production and of mine capacity in the United States, 1890–1927. For the 20 years from 1899 to 1919, according to studies of Prof. E. E. Day for the Harvard Economic Service, the production of bituminous coal grew at the average rate of 16,800,000 tons a year. Since then it has shown little or no increase. In the diagram Day's line of "normal trend" for the period up to 1919 is projected through the postwar period to bring out the striking change in the line of actual production. Had the former rate of growth continued, the production in 1927 would have been 160,000,000 tons greater than it actually was. At the same time that the former growth of demand was checked the capacity increased sharply and by 1923 the excess of capacity overproduction was so marked that readjustment became inevitable

Rapid growth of other sources of energy.—A factor in the slowing down of coal demand has been the rapid rise of the alternative sources of power. The following statement shows the percentage of increase or decrease in the annual supply of coal, oil, gas, and water power—first for the period 1913 to 1927, and second for the last decade.

	1913 to 1927	1917 to 1927
	Per cent	*Per cent*
Bituminous coal consumed	+9	−6
Anthracite consumed	−12	−20
Total coal	+5	−8
Oil produced	+262	+169
Natural gas produced	+148	+82
Water power produced	+186	+110
Total energy	+38	+18

Detailed data upon which this statement is based will be found in Tables 3 and 7. It will be noted that while the consumption of bituminous coal in 1927 was actually 6 per cent less than in 1917 the production of oil was 169 per cent greater, that of natural gas 82 per cent greater, and that of water power 110 per cent greater. The total supply of the raw materials of energy shows an increase of 18 per cent for the 10-year period, but the increase has come entirely from sources other than coal. As consumption in 1917 was undoubtedly stimulated by the war, perhaps a fairer basis of comparison is afforded by 1913. But even starting with 1913 the competitive sources show a rate in increase that far outstrips coal. From 1913 to 1927 the consumption of bituminous coal increased 9 per cent; the consumption of anthracite decreased slightly. During the same period oil production increased 262 per cent, natural gas 148 per cent, and water power 186 per cent.

Clearly much of this extraordinary increase in the other sources of power does not represent displacement of coal. The water power and most of the natural gas are meeting a need that could be supplied by coal, but the refined products of petroleum and even a large part of the fuel oil have been used for purposes that raw coal could not meet. Even fuel for internal-combustion engines, however, involves an invisible competition with coal; had not gasoline been available the need of a system of light transportation to supplement the railroads would doubtless have stimulated alternative means, such as electric traction driven by coal-generated electricity.

The unequal growth of the several forms of power has brought about a remarkable shift in the sources of the country's energy supply. In 1913 bituminous coal furnished 70.3 per cent of the total energy derived from mineral fuels and water power; in 1927 its share had fallen to 54.8 per cent. The percentage of the grand total derived from coal, oil and gas, and water power was as follows:

	Anthracite	Bituminous coal	Oil and gas	Water power	Total
1913	14.0	70.3	12.4	3.3	100.0
1927	8.8	54.8	29.6	6.8	100.0

The changes from year to year are shown graphically in Figure 12.

Advances in fuel efficiency.—Of equal importance in slowing down the growth of the demand has been the great improvement in the efficiency of fuel utilization. Wherever records of fuel performance are kept a story of reduced consumption per unit of product is found, particularly over the period since 1917. (See Tables 57 to 61.) The rate of improvement has naturally varied with the industry. It has been most marked in the field of power generation, but even those uses involving the direct application of heat show advances in lesser degree. This subject, however, can best be treated by considering individual industries.

TREND OF RAILROAD FUEL CONSUMPTION

The trend of demand becomes clearer if one considers not the total but the demand of the principal consuming groups, particularly for different grades of coal. If this is done it appears that while consumption for some uses is holding its own other uses show a sharp decline and still others a substantial increase. In general, consumption for what may be called "the power uses" is decreasing, while that for the "heat uses" shows a tendency to increase.

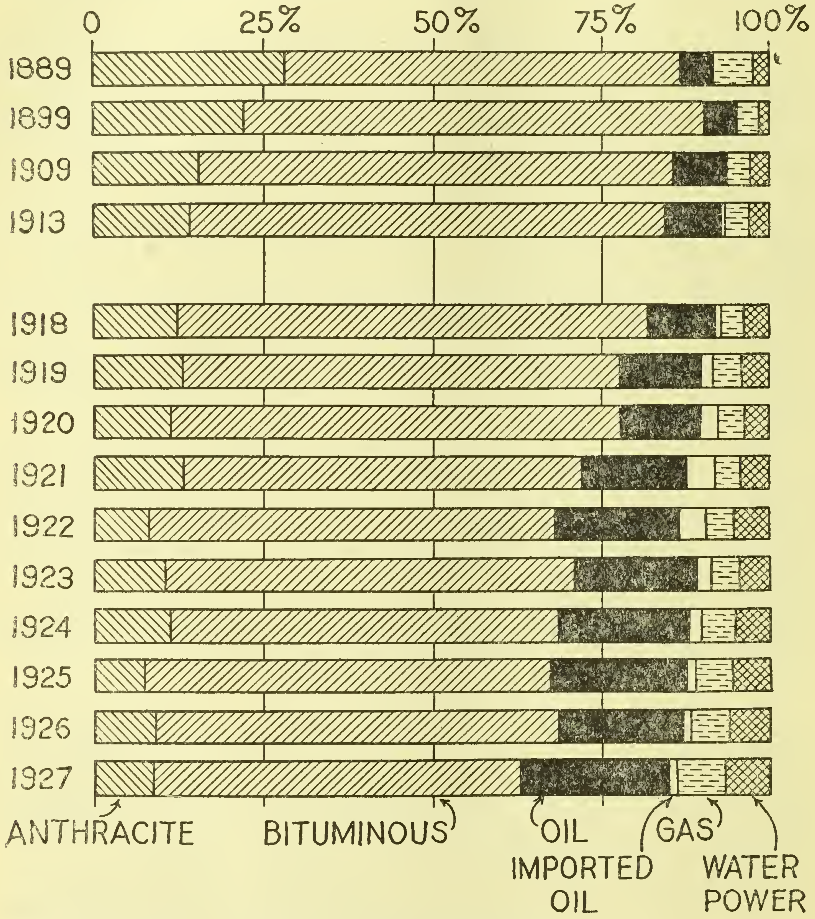

FIGURE 12.—Per cent of the energy supply of the United States derived from coal, oil, gas, and water power, 1889-1927

Typical of the power uses is the consumption of locomotive fuel, which, it will be remembered, absorbs about 24 per cent of the supply of bituminous coal. Figure 13 is designed to bring out the trends of the three principal factors controlling consumption: (1) The physical volume of rail transportation, (2) the progress of fuel efficiency, and (3) the use of competitive fuels. The resultant of these factors is the aggregate consumption of bituminous coal, shown by the heavy zigzag line in the lower half of the diagram.[19]

The trend of the physical volume of rail transportation is indicated in the upper half of the diagram. Both freight ton-miles and passenger-train car-miles have been increasing, in spite of the competition of motor vehicles. If the two are added (first multiplying the passenger-train car-miles by 40 to make them comparable in terms of fuel consumption), the result may be termed "total units of transportation." This is represented by the heavy black line at the top. It shows a substantial gain even in the period since the war, interrupted only by the occasional depressions of general business.

Offsetting the increase in traffic has been the marked improvement in fuel efficiency. The curve of pounds of coal per transportation unit declines rapidly from 1912 to 1916, halts during the period of disturbed coal supply from 1917 to 1922, and in 1923 again turns sharply downward.[20] In spite of the advances already made there is room for further improvement in fuel efficiency in bringing average performance nearer the level of what the best locomotives have already indicated is possible. The average consumption in the freight service in 1927 was 131 pounds per 1,000 gross ton-miles, but the Union Pacific Railroad reports a locomotive that uses only 70 pounds.[21]

The competition of other fuels in the railroad-fuel market is indicated by the curves of anthracite and fuel-oil consumption. The increase in oil has been partly offset by a decline in the use of hard coal by the anthracite carriers, which have turned more and more to bituminous coal, releasing anthracite for uses to which it is especially adapted. The consumption of oil increased sharply in 1923 but has shown no material change in the last three years.

The net result of the several factors has been an actual decline in the total consumption of bituminous coal. Although the railroads in 1927 did 9 per cent more work than in 1917, they required 13 per cent less bituminous coal.

TREND OF CONSUMPTION IN IRON AND STEEL INDUSTRY

A similar condition is shown by the iron and steel industry, which absorbs directly or indirectly 16 per cent of the total supply of bituminous coal. (See fig. 14.) The volume of the product is increasing, but advances in fuel efficiency have caused an actual reduction in the total consumption of coal.

The volume of the product may be measured by adding the tonnage of pig iron and half of the tonnage of steel, since it requires about half as much fuel to convert the pig into finished rolled products as it does to convert the ore into pig. The curve representing the two combined shows a very large increase in volume of product since 1913. In comparison with the war period many of the postwar years show a decrease, but it must be remembered that from 1916 to 1918 the production of steel was stimulated by the demand for munitions. Even on this basis, however, the active year 1926 shows an increase of 4 per cent over 1918.

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[19] The figures of coal consumption by locomotives for the years 1904 to 1916 used in Figure 13 were compiled by the authors from unpublished reports made by the individual carriers to the Interstate Commerce Commission and will be published in detail elsewhere. Other primary data are taken from Interstate Commerce Commission's Statistics of Railways of the United States.

[20] This ratio (represented by the dotted line in the upper diagram) is obtained by dividing the total quantity of locomotive fuel used for freight, passenger, and all other services (including the coal equivalent of oil) by the sum of the revenue ton-miles and the passenger-train car-miles × 40. It is used in place of the more accurate figure of pounds per 1,000 gross ton-miles or pounds per passenger-train car-mile because it can be calculated for the pre-war years, thereby indicating the trend over a longer period. (See Table 59.) The curve as plotted is a 3-year moving average of the annual observations.

[21] McAuliffe, E., Railway Fuel, New York, 1927, p. 323.

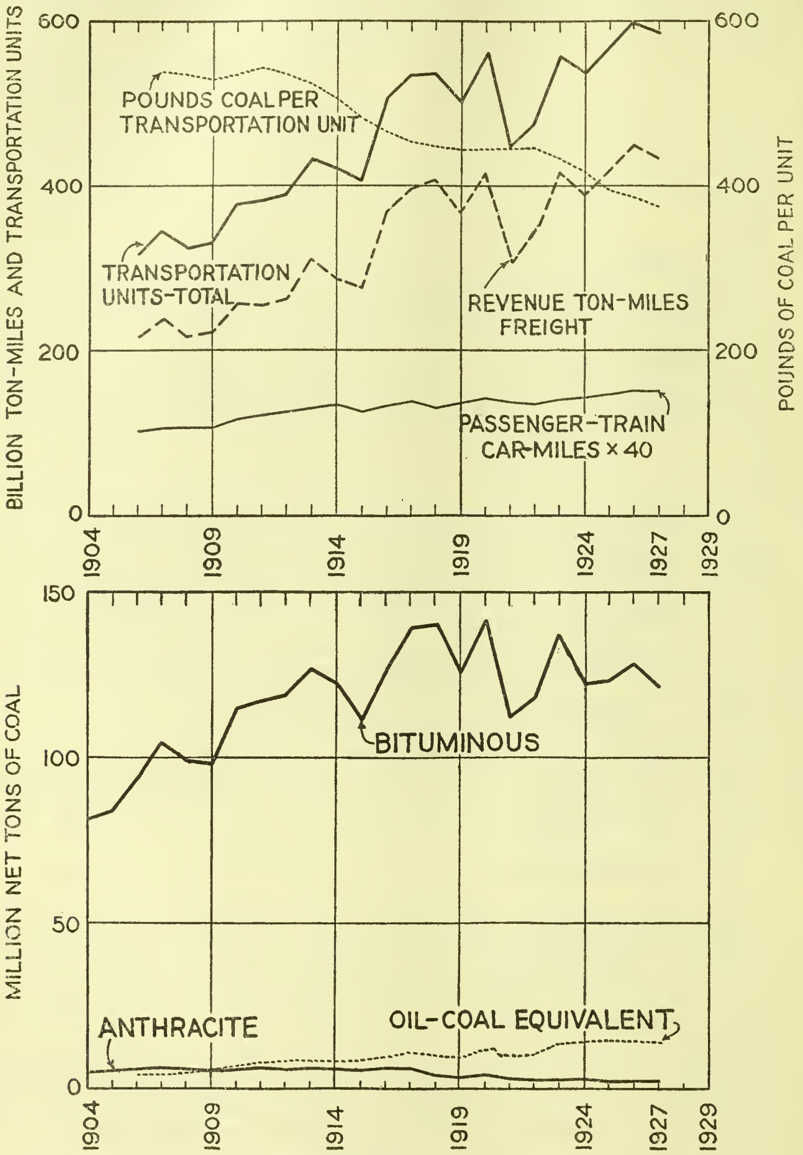

FIGURE 13.—Trends in consumption of fuel by steam locomotives in the United States, 1904–1927

Meanwhile, rapid progress has been made in fuel economy. (See also Tables 60 and 61.) In 1904 the ratio of tonnage of coal used (including the equivalent of fuel oil) to tonnage of product was 2.01;

in 1914 it was 1.8; and by 1927 it had fallen to about 1.4. The reduction in unit fuel consumption would appear still greater if it were possible to include data on natural gas, which has been declining in relative importance.[22] The largest element in this saving has undoubtedly been the substitution of by-product for beehive coke. The gas, tar, light oil, and breeze recovered at by-product plants in 1927 had a heat value equivalent to 15,600,000 tons of raw coal, as against 700,000 tons in 1904. (See Table 60.) It should be noted that the economies resulting from by-product coking approach a limit as the displacement of beehive coke becomes more nearly complete. Other factors in the reduction in fuel consumption per unit of product, which can not be evaluated here, are the growing use of scrap in the blast furnace, the rise of electric steel, and the tendency to purchase electric power from the public utilities.

Displacement of coal by fuel oil in this industry has been very small.

The net result of the several factors has been a sharp reduction in the total consumption of both gas and steam coal and coking coal by the iron and steel industry. In comparison with 1916 the active year 1926 shows an increase of 2,700,000 tons in volume of product but a decrease of 15,000,000 tons in the consumption of bituminous coal.[23]

TREND OF CONSUMPTION OF ELECTRIC UTILITIES

Even more striking have been the changes in the consumption by the electric utilities. (See fig. 15.) The business of the utilities has grown by leaps and bounds like a sum at interest compounding at the rate of 10 per cent. (See also Table 58.) In the last 25 years the total production of electric power by central stations and electric railways has increased nineteenfold. Part of the increase is due to the development of hydropower; but, as the diagram shows, the production of fuel power has risen from 4,000,000,000 kilowatt hours in 1902 to about 53,000,000,000 in 1928, an increase of thirteenfold. The consumption of coal has increased during the same period, but in much smaller ratio. In 1902 the utilities used, in round numbers, 11,000,000 tons; in 1928 they used 41,300,000, an increase of less than fourfold against the thirteenfold increase in power production.

This astonishing result has been made possible by improvements in fuel efficiency. In 1902 the average consumption per kilowatt-hour was about 6.6 pounds; by 1917 this had been cut to 3.3 pounds. Particularly rapid progress has been made since the war, and in 1927 the average fell to 1.84 pounds. Even this is much above the performance of the best plants to-day, and one station on the Ohio River below Cincinnati has touched a record of 0.86 pound per kilowatt-hour generated.[24]

Competition of oil and natural gas has been a minor factor in the coal requirements of the utilities. The use of these other fuels reached its maximum in 1924, when oil and gas equivalent to 5,500,000

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[22] Accurate figures on the consumption of natural gas by the iron and steel industry are not available. It is known, however, that the total consumption for all industrial purposes in the State of Pennsylvania declined from 121,000,000,000 cubic feet in 1906 to 70,000,000,000 in 1927.

[23] The data on fuel consumption in the iron and steel industry are derived from the annual coke chapters of Mineral Resources of the United States, the reports of the American Iron and Steel Institute, and the Census of Manufactures. Consumption of gas and steam coal is estimated for the intercensus years from the known production of iron and steel. Data will be published elsewhere in detail.

[24] De Forest, C. W., "12495 B. t u. per net kilowatt-hour": Elec. World, Feb. 12, 1927, p. 341.

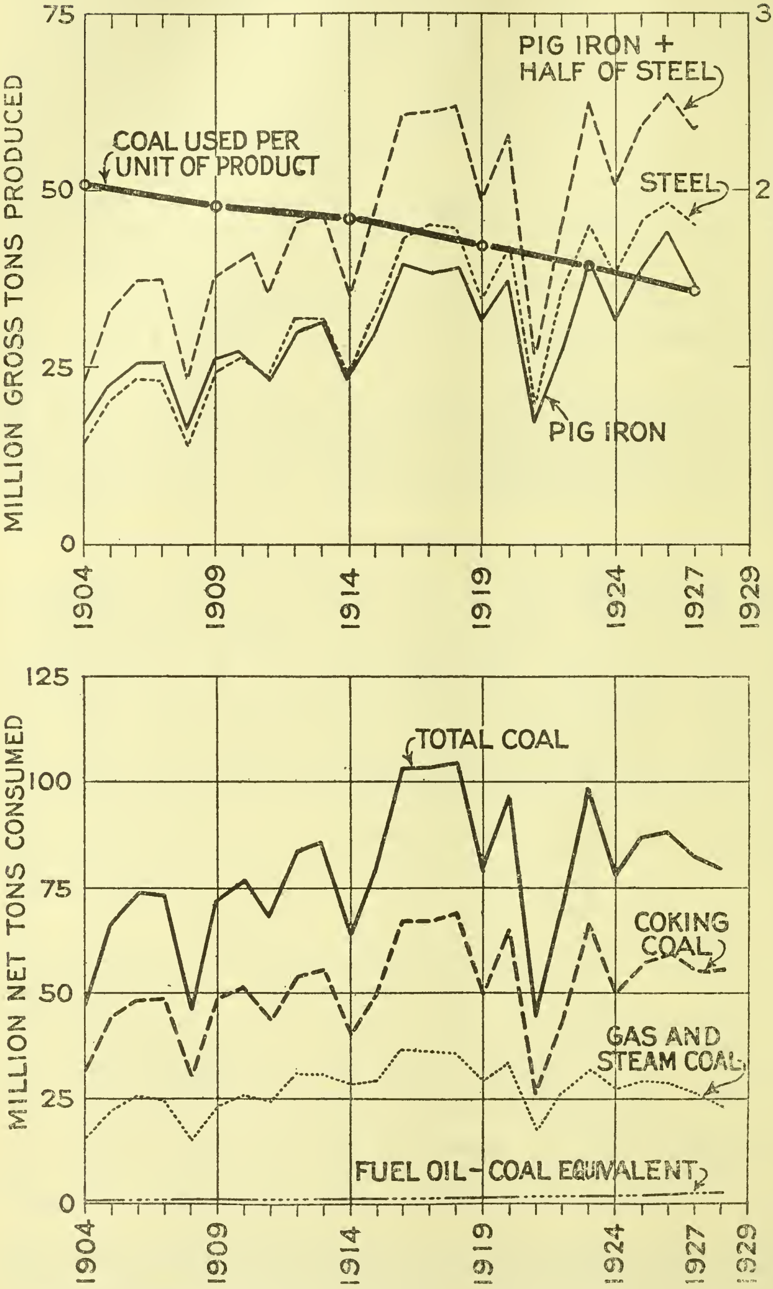

FIGURE 14.—Trends in consumption of fuel by blast furnaces, steelworks, and rolling mills in the United States, 1904–1928

tons of coal were consumed. Since then the consumption of oil has been declining, and the total of oil and gas in 1927 was equivalent to but 4,022,000 tons of coal, or 9 per cent of the total fuel consumption of the utilities.

The net result of these factors has been to hold the total coal consumption of the utilities virtually constant for the last four years.

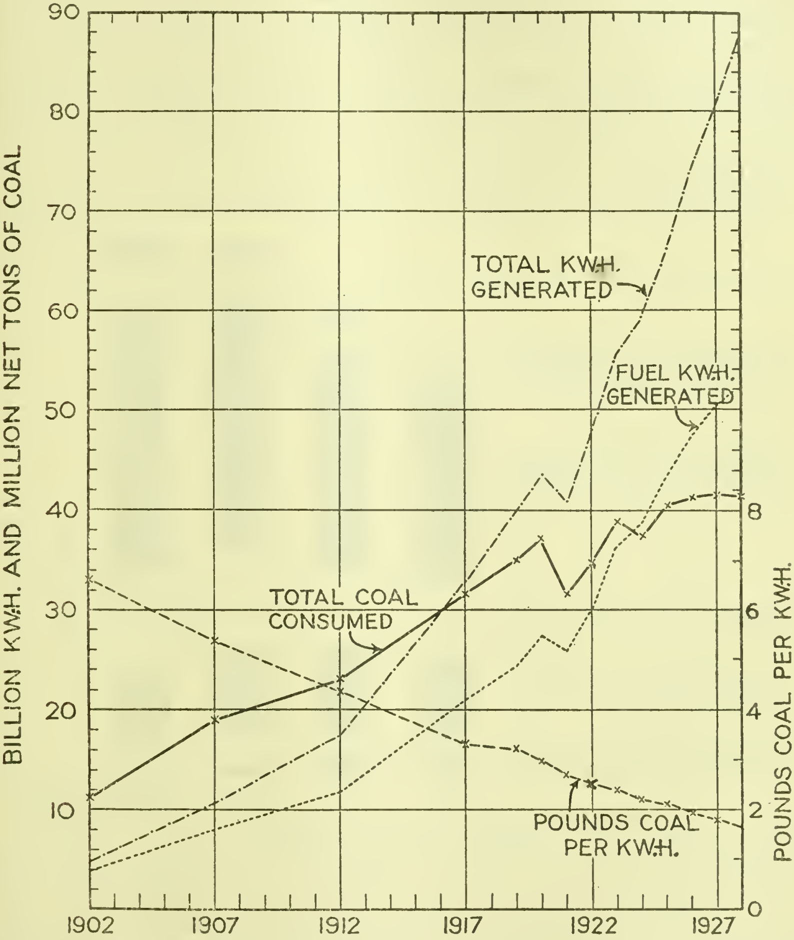

FIGURE 15.—Trends in consumption of fuel by electric power plants (public utilities) in the United States, 1902–1928

(See fig. 9.) Indeed, the consumption in 1928 was slightly less than that in 1927.[25]

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[25] For data on power production and fuel consumption see Horton, A. H., Developed and Potential Water Power in the United States and Production of Electricity by Public Utility Power Plants, 1919–1926: U. S. Geol. Survey Water Supply Paper 579, 1928, 210 pp.; also monthly power reports, mimeographed.

For the years before 1919 the data are taken from a special study by F. G. Tryon, to be published elsewhere. Certain incomplete data are given by the 5-year census of the electrical industries made by the Federal Bureau of the Census covering 1902, 1907, 1912, and 1917. The census does not separate the kilowatt-hours generated by fuels and by water but gives sufficient data on installed capacity of prime movers to permit an approximate separation. The quantity of coal used was reported in 1902 (incomplete) and 1917 (complete), and the cost of fuel was reported in 1902, 1907, 1912, and 1917, from which the total consumption and the pounds per kilowatt-hour have been derived. The result, though not precise, is reasonably accurate and indicates the trends.

TREND OF CONSUMPTION IN GENERAL MANUFACTURING

The advances of the electric utilities are naturally reflected in the trend of the general manufacturing industries which have been shutting down their isolated plants and purchasing more and more of their power from central electric stations. Even the plants which have continued to generate their own power have frequently shown improvements in fuel efficiency.[26] From 1909 to 1926 the physical volume of production of manufactured goods increased 74 per cent, but the consumption of coal in manufacturing increased only about 29 per cent. (See Table 54.) In fact, since 1919 the aggregate consumption in manufacturing has shown virtually no increase, although meanwhile the physical volume of the product has risen nearly 30 per cent.

This statement concerning manufacturing as a whole conceals a remarkable change in the relative requirements of the industries using fuel primarily for power and those using it primarily for heat. (See Table 54 and fig. 16.) A group of 22 "power industries," of which cotton textiles are typical, consumed 16.7 million tons of coal in 1909. (See fig. 16.) During the next 10 years their consumption increased, rising to 19.1 million tons in 1919. Thereafter, with the rapid substitution of central-station power, their coal requirements declined, reaching 15.4 million in 1923, the latest year for which detailed data by industries are available.

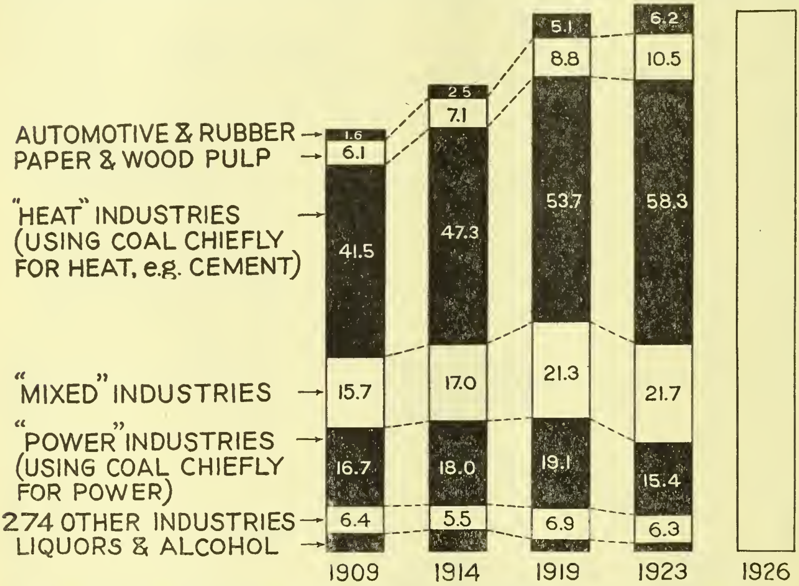

FIGURE 16.—Consumption of coal by general manufacturing plants (not including steelworks and coke and gas plants), 1909–1926

In sharp contrast, a group of 32 "heat industries"—that is, industries consuming fuel chiefly for direct application of heat, such as the manufacture of cement, clay products, glass, and lime—have shown a continuous increase. Their requirements rose from 41.5 million tons in 1909 to 53.7 in 1919 and 58.3 in 1923. A group of 18 "mixed industries" shows a trend intermediate between the heat group and the power group.

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[26] Gould and Henderson report average savings in fuel consumption of 17 per cent merely by the better utilization of existing equipment. See Even Better Steam Generation, Fuel Engineering Co. of New York, 1927, pp. 4–30.

The automotive industries are shown separately in Figure 16 because their extremely rapid growth would otherwise distort the picture. Including the related manufacture of rubber goods the consumption of the automotive group grew from 1.6 million in 1909 to 6.2 in 1923. This large increase in fuel consumption falls far short of the increase in the number of cars and trucks produced, which rose from 131,000 in 1909 to 4,020,000 in 1923. Thus, while the coal consumption of the automotive industries increased a little less than fourfold the volume of production of finished cars increased more than thirtyfold, a result largely made possible by the purchase of central-station power. The paper and wood-pulp industry and the liquors and alcohol industries are also shown separately in these comparisons, the former because of its rapid growth and the latter because of its notable decline.

This sharp difference in the trend of the fuel requirements of the heat-using and power-using industries should be considered in any attempt to forecast the future demand for coal.

TABLE 54.—*Index numbers of consumption of coal by manufacturing industries and of physical volume of manufacturing production*

[1909 rate=100]

	1909	1914	1919	1923	1926
Indexes of coal consumption:[1]					
22 "power" industries	100	108	115	92	(2)
32 "heat" industries	100	114	130	140.4	(2)
18 "mixed" industries	100	108	136	138.6	(2)
4 industries affected by abnormal growth or decline—					
Automobile and rubber	100	157	317	382	(2)
Paper and wood pulp	100	117	145	173	(2)
Liquors and alcohol	100	113	60	30	(2)
274 other industries, consuming little coal	100	85	108	97	(2)
Total, 350 industries [1]	100	111	128	130	[3] 129
Index of physical volume of manufacturing production [4]	100	106	135	164	174

[1] Includes anthracite as well as bituminous coal, as the two can not be separated for 1923. Excludes blast furnaces, steelworks, and coke and gas plants. Primary data from the Census of Manufactures.

[2] Data by groups of industries not available.

[3] Subject to revision.

[4] From p. 34 of Census Monograph 8; the Growth of Manufactures, 1899 to 1923, by Edmund E. Day and Woodlief Thomas. Original data recalculated to 1909 base. Note that these figures include blast furnaces, steelworks, and coke and gas plants, and are therefore not exactly comparable with those for fuel consumption above. The discrepancy, however, is not serious.

CHANGES IN PERCENTAGE DISTRIBUTION OF TOTAL

Figure 17 and Table 55 bring together the record for all of the principal classes of consumers for the period from 1889 to 1927. When the consumption of each group is shown as a percentage of the total it is curious how little change has occurred in this period of nearly 40 years. In 1889 locomotive fuel constituted 27.7 per cent of the total bituminous consumption of the country; in 1923, 26.4 per cent; and in 1927, 24.2. The coke ovens in 1889 consumed 16.7 per cent of the total and in 1923, 16.3 per cent. In 1889 the gas and steam coal requirements of the iron and steel works accounted for 5.3 per cent of the total and in 1927 for 5.1 per cent. The occasional fluctuations in the percentages for coke and steel during the intervening years reflect the periods of business depression which fell with peculiar severity upon the iron and steel industry. The consumption of fuel at bituminous coal mines, never a large item, rose from 1889 to 1914 with the increasing use of power, but since that time has declined as the mines have turned to electric power from central stations. The only group of consumers whose proportion has markedly changed is the electric utilities, and even here the change is less than might be expected because of the extraordinary advances in fuel economy. In 1889 the consumption by electric plants was negligible, but in 1904 when the statistical record becomes trustworthy they were already taking 4.9 per cent of the grand total. The maximum reached in 1927 was 7.9 per cent.

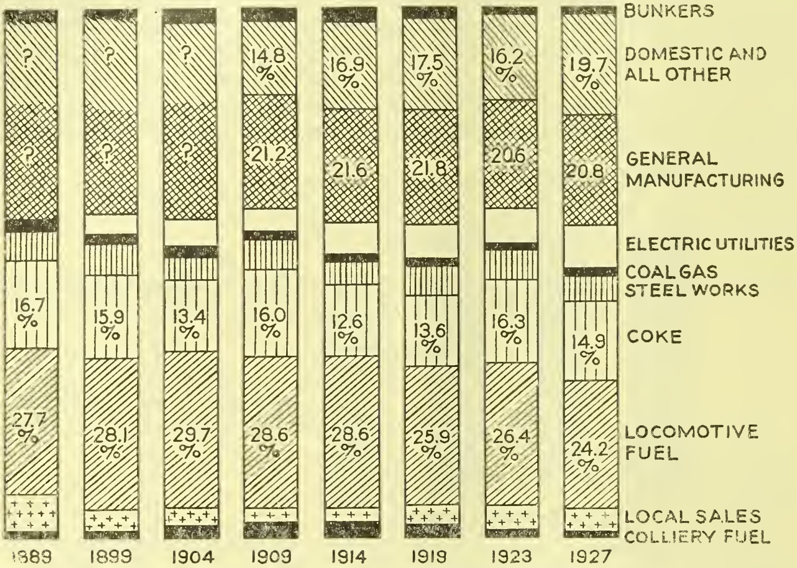

FIGURE 17.—Per cent of the total consumption of bituminous coal taken by the principal classes of consumers, 1889–1927

The consumption for "general manufacturing" and for "domestic and all other purposes" can not be separated until 1909. In that year general manufacturing consumed 21.2 per cent of the total, a proportion that has since shown curiously little change. The consumption for domestic and all other purposes does, however, show a fairly steady growth. In 1909 it amounted to 14.8 per cent of the total and by 1927 had increased to 19.7 per cent.

Table 55.—*Trend of consumption of bituminous coal by the principal classes of consumers in the United States, 1889–1927*

[The purpose of this table is to show the consumption of each of the principal groups over a long enough period to establish the trend. To do this it was necessary to assemble data from all possible sources, many of them unpublished, and piece them together. Where the tonnage consumed was not known it could often be estimated from data on the cost of the fuel consumed or on the physical volume of the product of the industry. To insure comparability, certain items have been regrouped so that the figures do not agree exactly with previous compilations for 1915, 1917, 1918, and 1923, or with the percentages in Table 52. As they stand the figures are thoroughly comparable from year to year. Subject to revision especially for 1927, as the authors obtain additional data]

	1889	1899	1904	1909	1914	1919	1923	1927[1]
Million net tons consumed:								
a. Colliery fuel	1.4	3.1	6.3	9.5	10.4	11.1	8.8	4.9
b. Local sales at mines, not shipped [2]	6.4	7.8	9.6	12.0	13.0	18.1	22.1	21.9
c. Locomotive fuel, all steam roads [3]	26.5	53.4	81.0	106.0	117.0	124.7	137.0	121.0
d. Bunkers, vessels in foreign trade	[4] 1.9	[4] 3.8	[4] 5.5	6.8	8.2	8.2	5.0	4.6
e. Coke ovens, beehive and by-product	16.0	30.2	36.5	59.4	51.6	65.6	84.4	74.4
f. Iron and steel works (gas coal and steam coal) [5]	5.1	11.8	13.8	20.9	22.2	28.2	30.2	25.3
g. Coal and water gas plants [6]	1.9	2.3	3.5	3.8	4.4	4.4	4.9	5.3
h. Electric public utilities [7]	([8])	7.6	13.5	18.7	24.6	32.0	35.5	39.8
i. General manufacturing industries [9]	36.6	70.3	103.5	78.5	88.3	104.8	107.2	104.2
j. Domestic and all other [10]				54.7	69.1	84.5	83.9	98.4
Total	95.8	190.3	273.2	370.3	408.8	481.6	519.0	499.8
Per cent of total consumption:								
a. Colliery fuel	1.5	1.6	2.3	2.6	2.6	2.3	1.7	1.0
b. Local sales at mines, not shipped	6.7	4.1	3.5	3.2	3.2	3.8	4.3	4.4
c. Locomotive fuel, all steam roads	27.7	28.1	29.7	28.6	28.6	25.9	26.4	24.2
d. Bunkers, vessels in foreign trade	[4] 2.0	[4] 2.0	[4] 2.0	1.9	2.0	1.7	1.0	.9
e. Coke ovens, beehive and by-product	16.7	15.9	13.4	16.0	12.6	13.6	16.3	14.9
f. Iron and steel works (gas coal and steam coal)	5.3	6.2	5.0	5.7	5.4	5.8	5.8	5.1
g. Coal and water gas plants	2.1	1.2	1.3	1.0	1.1	.9	.9	1.1
h. Electric public utilities	([8])	4.0	4.9	5.0	6.0	6.7	6.8	7.9
i. General manufacturing industries	38.0	36.9	37.9	21.2	21.6	21.8	20.6	20.8
j. Domestic and all other				14.8	16.9	17.5	16.2	19.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Data for 1927 preliminary.

[2] Item *b* includes coal used by mine employees and sold for domestic purposes in the vicinity of the mine. It also includes an unknown amount taken by locomotive tenders at the tipple or sold to a near-by factory or power plant. It therefore involves an unknown amount of overlapping with items *c*, *h*, and *i*. Double counting in the total is avoided by an adjustment in item *j*, which is obtained by subtracting the sum of all other items from the known total.

[3] Based on reports of the railroads to the Interstate Commerce Commission, those before 1919 not having been previously published. For certain years where only the Class I roads were reported, estimates are included for Class II and III roads and switching and terminal companies.

[4] Figures for 1889, 1899, and 1904 are rough estimates, no data being available before 1906.

[5] Figures include all coal used except that charged in coke ovens. Data for 1889 to 1923 from Census of Manufactures (those for 1904 partly estimated); for 1927, from quarterly stock reports to Bureau of Mines.

[6] Includes coal for gas making only. Excludes coal charged in by-product coke ovens operated by city gas companies, which is included under item *e*. Data from Census of Manufactures and U. S. Geological Survey reports.

[7] Includes electric central stations and street railways. Data for 1919 to 1927 from monthly power reports of U. S. Geological Survey, for 1889 to 1914 estimated from quinquennial census of electrical industries.

[8] Coal was used for electric power generation as early as 1882, but even by 1889 the quantity consumed must have been small.

[9] From the Census of Manufactures, excluding coal consumed in coke ovens, iron and steel works, and for gas making at coal and water-gas plants. Includes consumption of railroad-car shops, which is included under railroads in Table 52. Figures for 1927 estimated from quarterly stock reports to U. S. Bureau of Mines. No data are available prior to 1909.

[10] Includes heating of large buildings other than factories, and also some nondomestic uses not covered elsewhere. See also item *b* and note [2]. Obtained by subtracting sum of the other known items from the known total. Because of this, it is affected by any errors in the other items, and there is evidence that the figure for 1919 (84.5 million tons) is too high and the figure for 1923 (83.9 million tons) too low.

INCREASE IN CONSUMPTION FOR HEATING BUILDINGS

The consumption of bituminous coal for heating houses and other buildings therefore appears to be increasing. Not only does the percentage devoted to this purpose increase (fig. 17) but the tonnage actually consumed as well. (See Table 55.)

The data on this subject are less accurate than is desirable, but they seem to justify the following conclusions:

(1) Not merely is population increasing, but the per capita consumption of fuel for heating is increasing. Higher standards are

maintained in American homes, and more fuel is required to keep people warm outside their homes. Children spend a longer period in school, more women work outside their homes, and people spend a larger proportion of their time in places of amusement. All this increases the heating load. The per capita consumption of coal (anthracite as well as bituminous) for "domestic and all other purposes" has increased between 12 and 20 per cent since 1909.

(2) Most of this increase in the heating load has gone to bituminous coal rather than to anthracite. The larger buildings tend to use bituminous and the anthracite sold is concentrated more and more on the heating of houses, for which purpose it is admirably adapted. The expansion of bituminous coal in this field is doubtless assisted by the increasing proportion of the total population living in apartments.

(3) The result is a net increase in the tonnage of bituminous coal used for domestic and other heating, an increase that is reflected in the active interest in screening and sizing which is apparent in many mining districts.

FUTURE OF COAL CONSUMPTION

As to the probable trend of demand in the future, the writers venture no prediction, although they believe the new data presented in this report will be helpful to others who may undertake a forecast. It seems clear that the total demand for power and heat in all forms, which is still increasing at a wholesome rate, may be expected to continue to increase. It will not only grow with population, but the per capita consumption will probably increase.

It is also clear that whatever of this total demand for energy is not supplied by oil, gas, and water power will fall back upon coal. The possibilities of water power are limited. The great variable, the most uncertain factor in the future of coal, is the consumption of oil and gas. Most observers expect the production of petroleum to decline sooner or later, and when it does a great increase in coal consumption may be anticipated.

As to the factor of fuel economy, all will agree that the present rapid rate of improvement in fuel efficiency is not likely to continue indefinitely. The progress since 1917 is largely a taking up of slack, a general adoption of principles already known to engineers. On the other hand, the advances in efficiency give no promise of terminating abruptly, for there is still room for great improvement in bringing average performance nearer to the level of what the best performance has already indicated is possible.[27]

An analysis of consumption may well close with a quotation from the English economist Jevons, whose famous book, The Coal Question, published in 1865, forecast successfully the general course of the British coal trade for the next half century.

> It is * * * a confusion of ideas to suppose that the economical use of fuel is equivalent to a diminished consumption * * *. As a rule, new modes of economy will lead to an increase of consumption according to a principle recognized in many parallel instances * * *. If the quantity of coal used in a blast furnace * * * be diminished in comparison with the yield, the profits of the trade will increase, new capital will be attracted, the prices of pig iron will fall, but the demand for it increase; and eventually the greater number of furnaces will more than make up for the diminished consumption of each. And if

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[27] See Coal in 1926, pp. 449-450.

> such is not always the result within a single branch, it must be remembered that the progress of any branch of manufacture excites a new activity in most other branches. * * *. The whole history of the steam engine is one of economy. In less than one hundred years * * * the efficiency of the engine has been increased at least ten-fold * * *. The reduction of the consumption of coal per ton of iron to less than one-third of its former amount was followed, in Scotland, by a ten-fold total consumption, between the years 1830 and 1863, not to speak of the indirect effect of cheap iron in accelerating other coal-consuming branches of industry * * *. And if economy in the past has been the main source of our progress and growing consumption of coal, the same effect will follow from the same cause in the future.[28]

This prophecy, uttered in 1865, held true for 50 years. Is it not conceivable that it will be found true again, after the present tendency in coal consumption has run its course?

CONSUMPTION IN EACH STATE

Statistics of bituminous coal consumption by States were published in Coal in 1917, Part B, p. 1254, and in Coal in 1918, Part B, p. 1366. Complete figures for all uses are not available by States for any later year; but certain larger items, such as coal charged in coke ovens, have been measured as recently as 1927. Table 56 brings together the latest information available concerning each item. For the very important item of consumption for domestic purposes no data by States have been collected since 1917, and for the consumption of mines and quarries none since 1919. Manufacturing (other than coke) is represented in the table by 1923 and coal-mine fuel by 1926. For the coke plants and electric utilities 1927 data are available.

The total consumption accounted for is 328,000,000 tons. This does not include railway and steamship fuel, which can not be apportioned by States, or a number of other items for which no data are available, such as waterworks, threshing engines, the construction industry, small manufacturing plants whose annual product is worth less than $5,000, custom gristmills and sawmills, power laundries, garages and service stations, and heating of many large buildings.

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[28] Jevons, W. Stanley, The Coal Question: London, 3d ed., edited by Flux, pp. 140-156.

TABLE 56.—*Bituminous coal consumed, by States, in net tons*

[Railway fuel and bunker fuel for steam vessels not included in this table]

State	Used at mines for steam and heat (1926)	Consumed in manufactures other than coke plants (1923) [1]	Consumed in the manufacture of by-product coke (1927)	Consumed in the manufacture of beehive coke (1927)	Consumed in electric utility power plants (1927) [2]	Consumed for domestic purposes (1917)	Consumed in mines and quarries other than bituminous coal mines (1919) [3]	Total consumption accounted for
Alabama	269,194	1,779,173	6,203,290		335,831	651,000	251,453	9,489,941
Arizona		129,736				65,000	85,230	279,966
Arkansas	15,192	194,520			113,040	300,000	15,260	638,012
California	40	45,959				355,000	1,988	402,987
Colorado	249,156	1,758,997	867,792	299,559	410,593	1,450,000	126,417	5,162,514
Delaware		429,397			114,013	20,000	2,543	565,953
District of Columbia		87,081			321,387	250,000		658,468
Florida		116,953			22,205	90,000	32,688	261,846
Georgia	1,344	1,498,184		(4)	80,977	871,000	55,354	2,506,859
Idaho	1,200	140,784				300,000	17,395	459,379
Illinois	1,021,148	14,292,311	4,367,337		5,811,818	9,721,000	145,848	35,359,462
Indiana	417,163	10,880,918	7,448,393		2,145,923	3,500,000	75,122	24,467,519
Iowa	93,458	2,356,520			880,169	2,912,000	26,734	6,268,881
Kansas	51,064	945,595			362,384	1,800,000	42,862	3,201,905
Kentucky	491,239	2,248,852	(4)	(4)	564,859	1,864,000	45,158	5,214,108
Louisiana		260,928			256,227	370,000		887,155
Maryland	17,481	1,535,793	1,476,742		473,440	352,000	21,565	3,877,021
Michigan	49,437	8,533,133	2,693,576		2,056,883	2,974,000	1,293,545	17,600,574
Minnesota		2,145,291	919,801		431,020	2,637,000	738,750	6,871,862
Mississippi		409,274			82,665	300,000		791,939
Missouri	46,194	4,153,165	(4)		1,061,717	3,000,000	345,425	8,606,501
Montana	49,567	558,889			33,192	885,000	166,483	1,693,131
Nebraska		694,744			446,371	1,425,000	1,834	2,567,949
Nevada		148,786				100,000	113,862	362,648
New England		9,312,808	1,092,900		2,709,503	1,655,000	80,377	14,850,588
New Jersey		4,335,267	1,244,627		1,515,113	90,000	62,486	7,247,493
New Mexico	49,671	130,233			23,142	175,000	189,732	567,778
New York		11,402,105	5,114,280		5,504,525	1,242,000	82,852	23,345,762
North Carolina	4,457	2,042,240			799,987	820,000	41,239	3,707,923
North Dakota	35,570	188,678			196,572	655,000		1,075,820
Ohio	268,992	[5] 19,218,980	10,470,533	(4)	4,054,827	4,900,000	188,026	39,101,358
Oklahoma	66,688	287,791			379,202	775,000	105,272	1,613,953
Oregon		103,249			1,242	225,000	411	329,902
Pennsylvania	1,492,806	28,932,833	16,690,980	8,729,862	5,863,870	1,836,000	269,927	63,816,278
South Carolina		835,344			336,277	480,000	18,949	1,670,570
South Dakota		83,986			118,792	570,000	43,083	815,861
Tennessee	76,218	2,017,723	162,372	185,829	397,110	1,211,000	157,427	4,207,679
Texas	17,662	605,553			658,209	650,000	14,190	1,945,614

Utah	147,716	576,233	318,367	142,053	13,548	815,000	115,917	2,028,834
Virginia	52,979	2,012,042		528,032	735,874	906,000	96,840	4,331,767
Washington	49,920	353,795	64,926	47,953	6,004	650,000	24,616	1,197,214
West Virginia	602,048	2,728,882	2,065,812	898,043	1,665,733	475,000	33,377	8,468,895
Wisconsin		5,335,658	(4)		803,315	2,532,000	59,518	8,730,491
Wyoming	189,398	122,009			100,938	250,000	19,563	681,908
	5,727,002	145,970,392	61,201,728	10,831,331	41,888,497	57,104,000	5,209,318	327,932,268

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[1] Census of Manufactures, 1923. From the census figures has been deducted the quantity of coal used in making coke, as shown in Mineral Resources, for all States except Pennsylvania. For the latter State the amount of coal consumed in the manufacture of coke as reported by the census is deducted.

[2] From report of Division of Power Resources, U. S. Geological Survey.

[3] Fourteenth Census, vol. II. From the census figures on total quantities of bituminous coal consumed by mines and quarries have been deducted the census figures on quantities consumed by bituminous coal mines.

[4] Coal used in manufacture of coke from Census of Manufactures, 1923, included in column 2.

[5] Census of Manufactures, 1923, minus the 9,290,435 tons consumed in by-product ovens as recorded in Mineral Resources.

FUEL ECONOMY

TABLE 57.—*Indicators of the effect of fuel economy on consumption of coal per unit of performance since the war*

	Pounds	Per cent reduction
Steam railroads:		
Pounds per 1,000 gross ton-miles freight service—		
Average, 1919–20	170	----------
Average, 1927	131	22.9
Pounds per passenger-train car-mile—		
Average, 1919–20	18.5	----------
Average, 1927	15.4	16.8
Steam electric power plants:		
Pounds per kilowatt-hour, 1919	3.2	----------
Pounds per kilowatt-hour, 1927	1.84	42.5
Iron and steel—pounds coking coal per ton of pig: [1]		
1918	3,577	----------
1927	3,053	14.6
Coke manufacture: Savings of heat values through recovery of gas tar, light oils, and breeze by extension of by-product in place of beehive coking, 1913 to 1927, expressed as per cent of coal used for all coke in 1927 [2]	----------	17.5

[1] Includes only savings through higher yields of merchantable coke per ton of coal charged and lower consumption of coke per ton of iron. Excludes economies through recovery of by-products, which are treated in next item.

[2] These by-products are used in part for boiler fuel, in part for metallurgical purposes, in part for domestic heating and cooking, and to a small extent for automotive fuel.

TABLE 58.—*Fuel consumption by electric public utility plants in the United States, 1919–1927*

[From reports of division of power resources, United States Geological Survey]

Year	Kilowatt-hours generated (millions)			Per cent of total		Fuel consumed, coal and coal equivalent, net tons	Pounds of fuel consumed by fuel stations	
	By water	By fuel [1]	Total	By water	By fuel		Per kilowatt-hour	Per horsepower-hour
1919	14,606	24,315	38,921	37.5	62.5	38,880,000	3.2	2.4
1920	16,150	27,405	43,555	37.1	62.9	41,420,000	3.0	2.2
1921	14,970	26,005	40,975	36.5	63.5	35,240,000	2.7	2.0
1922	17,207	30,447	47,654	36.1	63.9	38,000,000	2.5	1.9
1923	19,343	36,322	55,665	34.8	65.2	43,522,000	2.4	1.8
1924	19,969	39,044	59,013	33.8	66.2	43,130,000	2.2	1.64
1925	22,356	43,514	65,870	33.9	66.1	44,780,000	2.1	1.57
1926	26,189	47,602	73,791	35.5	64.5	45,856,000	1.95	1.46
1927	29,875	50,330	80,205	37.2	62.8	45,910,000	1.84	1.37

[1] Includes power generated from wood, which in 1927 amounted to 336,000,000 kilowatt-hours. This is excluded in the calculation of total fuel consumed and average consumption per kilowatt-hour and horsepower-hour given in the last three columns.

TABLE 59.—*Consumption of coal (or coal equivalent of other fuel) by locomotives in road service on class 1 steam railroads, as reported monthly by the Interstate Commerce Commission, 1916–1927*

Year	Pounds of coal per 1,000 gross ton-miles, including locomotive and tender	Pounds of coal per passenger-train car-mile	Year	Pounds of coal per 1,000 gross ton-miles, including locomotive and tender	Pounds of coal per passenger-train car-mile
1916	[1] 169	[1] 18.5	1922	163	17.9
1917	[1] 176	[1] 19.4	1923	161	18.1
1918	[1] 174	[1] 19.2	1924	149	17.0
1919	[1] 164	[1] 18.1	1925	140	16.1
1920	[2] 174	[2] 18.8	1926	137	15.8
1921	162	17.7	1927	131	15.4

[1] From reports of the fuel conservation section of the United States Railroad Administration, prepared under direction of Eugene McAuliffe. These reports gave the consumption per 1,000 gross ton-miles, excluding locomotive and tender, from which the ratio used above has been estimated.

[2] Estimated from the ratio per 1,000 gross ton-miles, excluding locomotive and tender, which bears a practically constant relation to the other.

TABLE 60.—*Fuel economy as indicated by the coal equivalent of the thermal by-products of coking in by-product ovens, 1913–1927*

[By-products included are coke breeze, which is not generally recovered in the manufacture of beehive coke, surplus gas not used in heating ovens, tar, and light oil]

Year	Equivalent coal (net tons)	Per cent which this forms of total coal made into coke	Increase in coal equivalent over 1913	Year	Equivalent coal (net tons)	Per cent which this forms of total coal made into coke	Increase in coal equivalent over 1913
1913	2, 600, 000	3. 8		1921	6, 461, 000	17. 4	+3, 861, 000
1914	2, 461, 000	4. 8	−139, 000	1922	9, 058, 000	16. 7	+6, 458, 000
1915	3, 280, 000	5. 3	+680, 000	1923	12, 417, 000	14. 7	+9, 817, 000
1916	4, 375, 000	5. 4	+1, 775, 000	1924	11, 628, 000	17. 9	+9, 028, 000
1917	5, 432, 000	6. 5	+2, 832, 000	1925	13, 786, 000	18. 5	+11, 186, 000
1918	6, 785, 000	8. 0	+4, 185, 000	1926	15, 394, 000	18. 6	+12, 794, 000
1919	7, 575, 000	11. 5	+4, 975, 000	1927	15, 640, 000	21. 0	+13, 040, 000
1920	9, 316, 000	12. 2	+6, 716, 000				

TABLE 61.—*Fuel economy in manufacture of pig iron, 1912–1927*

Year	Pounds coke per gross ton pig iron and ferro-alloys [1]	Yield of coke from coal (per cent)	Pounds coal per gross ton of pig iron and ferro-alloys (column 1 divided by column 2)	Year	Pounds coke per gross ton pig iron and ferro-alloys [1]	Yield of coke from coal (per cent)	Pounds coal per gross ton of pig iron and ferro-alloys (column 1 divided by column 2)
1912	2, 436. 5	67. 1	3, 631. 1	1920	2, 305. 6	67. 4	3, 420. 8
1913	2, 433. 3	66. 9	3, 637. 2	1921	2, 200. 6	68. 0	3, 236. 2
1914	2, 354. 4	66. 9	3, 519. 3	1922	2, 176. 3	68. 3	3, 186. 4
1915	2, 252. 0	67. 2	3, 351. 2	1923	2, 243. 3	67. 5	3, 323. 4
1916	2, 285. 3	66. 8	3, 421. 1	1924	2, 212. 0	68. 1	3, 248. 2
1917	2, 339. 7	66. 4	3, 523. 6	1925	2, 150. 4	68. 8	3, 125. 6
1918	2, 375. 2	66. 4	3, 577. 1	1926 [2]	2, 060. 9	68. 6	3, 004. 2
1919	2, 310. 2	67. 4	3, 427. 6	1927 [2]	2, 094. 1	68. 6	3, 052. 6

[1] According to annual report, American Iron and Steel Institute. No data were published prior to 1912.
Exclusive of coke consumed in the manufacture of ferro-alloys.

STOCKS OF COAL HELD BY CONSUMERS

Bituminous coal is seldom stored at the mines. The chief element in the reserves aboveground is the quantity held by consumers, which during the decade covered by the statistical record has fluctuated between a minimum of 20,000,000 and a maximum of 75,000,000 tons. The trend of stocks in 1927 and its influence upon the market have already been pointed out (p. 331). A statistical summary of the stocks of consumers since October 1, 1916, the date of the earliest survey of stocks, is given in Table 62. (See also fig. 2.) Details by localities appear in the quarterly mimeographed reports on stocks, which may be obtained upon application to the Bureau of Mines.

No record is available in tons of the total stocks of anthracite, but the last column of Table 62 shows the number of day's supply in the yards of a representative group of retail dealers.

TABLE 62.—*Stocks of bituminous coal in hands of commercial consumers and stocks of anthracite and bituminous coal in retail dealers' yards, 1916–1927*

[From periodic stock reports of the Bureau of Mines. Coal for steamship fuel, on Lake docks, in transit, and in the bins of householders is not included]

Date	Total stock of bituminous coal estimated (tons) [1]	Day's supply at current rate of consumption on date of stock taking								
		By-product coke plants	Steel plants	Other industrials	Coal-gas plants	Electric utilities	Coal dealers, bituminous	Railroads	Total bituminous	Anthracite in retail yards
1916—Oct. 1	27,000,000	(2)	25		(2)	(2)	(2)	20	(3)	(2)
1917—Oct. 1	28,100,000	(2)	27		(2)	(2)	(2)	18	(4)	(2)
1918—July 15	39,700,000	28	27	48	72	39	15	25	31	(2)
Oct. 1	59,000,000	32	45	71	84	47	28	29	43	(2)
Armistice Day (Nov. 11)	63,000,000	35	45	71	85	49	37	31	45	(2)
1919—Jan. 1	57,900,000	32	42	65	81	49	39	32	42	36
Apr. 1	40,400,000	23	35	47	58	48	25	(2)	31	31
1920—Mar. 1	24,000,000	15	9	27	31	21	13	11	18	21
June 1	20,000,000	8	11	24	22	22	10	10	15	15
1921—Jan. 1	45,800,000	29	42	64	55	44	30	23	39	24
Apr. 1	39,500,000	28	38	47	66	48	26	24	36	36
Aug. 1	41,000,000	31	46	56	79	44	42	32	39	50
Nov. 1	48,500,000	38	46	67	87	54	46	31	43	47
1922—Jan. 1	48,000,000	42	48	51	89	51	33	35	41	44
Mar. 1	52,500,000	39	48	56	82	54	23	42	43	28
Apr. 1	[5] 63,000,000	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Sept. 1	22,000,000	11	12	32	34	26	11	13	17	5
Oct. 1	26,000,000	14	17	33	38	30	18	15	21	7
Nov. 1	32,000,000	18	21	39	55	32	21	13	23	11
1923—Jan. 1	36,000,000	19	27	40	60	33	18	16	26	11
Feb. 1	38,000,000	20	26	36	62	35	15	18	24	8
Mar. 1	36,000,000	19	26	34	58	34	11	16	22	6
June 1	42,000,000	23	29	39	75	45	27	21	30	19
July 1	46,000,000	26	35	46	89	48	39	28	37	25
Aug. 1	52,000,000	27	35	54	104	52	45	39	44	25
Sept. 1	56,000,000	30	33	56	110	52	38	44	46	21
Oct. 1	60,000,000	33	39	56	91	49	36	41	45	22
1924—Jan. 1	62,000,000	35	43	55	91	51	34	44	46	37
June 1	51,000,000	34	56	53	88	63	40	50	49	49
Sept. 1	47,000,000	30	42	48	90	58	46	42	45	58
1925—Jan. 1	[5] 45,000,000	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mar. 1	44,000,000	25	30	40	78	51	33	35	37	46
June 1	38,000,000	20	27	32	68	48	31	32	32	52
Sept. 1	43,000,000	22	30	30	67	43	27	28	32	53
Nov. 1	48,000,000	26	32	44	78	46	30	30	35	27
1926—Jan. 1	49,000,000	26	28	39	72	48	20	27	30	32
Feb. 1	45,000,000	23	26	37	67	47	17	25	28	18
Apr. 1	40,000,000	21	24	32	60	46	14	23	26	30
May 1	36,000,000	20	25	36	71	54	31	25	31	33
July 1	39,000,000	23	26	35	72	52	43	27	34	40
Aug. 1	41,000,000	24	32	35	61	45	31	30	33	44
Oct. 1	43,000,000	26	37	37	70	45	32	33	35	46
Dec. 31	55,000,000	34	50	41	69	47	23	33	37	54
1927—April 1	75,000,000	38	73	62	77	70	24	59	53	39
July 1	63,400,000	40	59	64	87	76	48	54	54	50
Aug. 1	60,100,000	39	63	63	91	69	41	50	53	57
Oct. 1	61,900,000	40	58	62	93	69	43	48	53	60
Nov. 1	61,300,000	42	50	52	81	61	34	43	46	60
Dec. 31	55,500,000	38	45	44	79	58	27	41	41	57

[1] The figures for 1918 in this table are based upon an actual count. Beginning with Apr. 1, 1919, the figures are based upon reports from a selected list of 5,000 consumers whose stocks in 1918 bore a known relation to the known total stocks.

[2] No data.

[3] Data incomplete. Estimated as 22 days.

[4] Data incomplete. Estimated as 21 days.

[5] No canvass of consumers was made on this date. The total was estimated from stocks reported in the preceding canvass.

DISTRIBUTION

Special reports on the distribution of coal were published in Mineral Resources for 1917 and 1918. These studies which traced the movement of coal from each major producing field to each consuming State, have been widely used by the coal trade.[29] They were made possible by financial assistance from the United States Fuel Administration. Lack of funds has since prevented repeating the analysis of distribution in detail, but a current record of certain major movements, such as the Lake, tidewater, and New England trades, has been issued in mimeographed form in the weekly coal report. To meet the general demand for distribution of statistics in permanent form, the principal features of the mimeographed series were condensed into summary tables and printed for the first time in Coal in 1926, pages 510 to 519. Certain items on distribution derived from the final annual reports of the coal operators were also included. The printed record thus begun is continued in the tables on pages 438 to 446.

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[29] Lesher, C. E., Coal in 1917, Pt. B, Distribution and Consumption: Mineral Resources of the United States, 1917, Pt. II, pp. 1203–1259; Coal in 1918, Pt. B, Distribution and Consumption: Mineral Resources, 1918 ,Pt. II, pp. 1315–1373. See also an earlier study in Mineral Resources, 1915, Pt. II, pp. 433–513.

MINE FUEL, LOCAL SALES, COAL COKED AT MINES, AND SHIPMENTS

The primary distribution classification is that shown in the basic tables of this report, namely, "used at mines for steam and heat," "sold to local trade," "made into coke at mines," and "loaded at mines for shipment." The proportion disposed of under these several classifications varies greatly from district to district, and it also tends to change with the years. (See Table 63.)

TABLE 63.—*Shift in disposal of total output of bituminous coal, 1890–1927*

Year	Per cent of total—				Year	Per cent of total—			
	Loaded at mines for shipment	Made into coke at mines	Sold to local trade	Used at mines for steam and heat		Loaded at mines for shipment	Made into coke at mines	Sold to local trade	Used at mines for steam and heat
1890	78.5	13.8	6.3	1.4	1919	87.8	5.9	3.9	2.4
1895	78.7	13.6	6.2	1.5	1920	88.8	5.4	3.7	2.1
1900	81.5	13.0	3.7	1.8	1921	91.8	2.1	3.9	2.2
1905	80.9	13.5	3.4	2.2	1922	90.9	3.1	4.1	1.9
1910	82.2	12.5	3.0	2.3	1923	89.6	4.9	3.9	1.6
1915	85.8	9.2	2.8	2.2	1924	91.3	3.0	4.3	1.4
1916	84.3	10.4	3.2	2.1	1925	91.8	3.0	4.1	1.1
1917	85.2	9.1	3.5	2.2	1926	91.8	3.1	4.1	1.0
1918	86.8	7.8	3.2	2.2	1927	92.7	2.1	4.2	1.0

Over the 38 years covered by the record there has been a notable decrease in the proportion used by the mines themselves because of the growing practice of buying power from central electric stations to operate the collieries. In 1927 the coal used for steam and heat at the mines was 4,930,394 tons, or only 1 per cent of the total. The most notable change in the disposal of the product has been the decline in the proportion made into coke at the mines. The quantity used for this purpose has fallen rapidly since the war, and in 1927 it amounted to 10,719,633 tons, or only 2.1 per cent of the total. This change has been due to the gradual replacement of beehive with by-product coke. The proportion of the output sold locally has of late years been increasing slightly and in 1927 amounted to 21,889,884 tons, or 4.2 per cent of the total. The net result of the several shifts in disposal has been to increase the proportion of the total output loaded at the mines for shipment. From 78.5 per cent of the total in 1890 the shipments have risen to 92.7 per cent in 1927.[30] Corresponding data for anthracite will be found in Table 17A (p. 499).

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[30] A more complete description of the trends indicated in this paragraph is given in Coal in 1926, pp. 502–503.

BITUMINOUS COAL LOADED FOR SHIPMENT BY INDIVIDUAL RAILROADS AND WATERWAYS, AS REPORTED BY OPERATORS

The sum of the coal charged into coke ovens at the mines, the local sales, and the mine fuel in 1927 was 37,539,911 tons out of a total production of 517,763,352 tons. The remainder, 480,223,441 tons, was loaded at the mines for shipment, and of this 17,532,105 tons was loaded into barges and other river vessels and 462,691,336 tons was loaded into railroad cars. Table 64 shows the quantity so originated on each railroad and waterway, as reported by mine operators in answer to the following question:

Railroads or waterways on which product was first loaded for shipment:
Name of road or waterway--
(Give shipments over each road separately) Tons
-- ------
-- ------
-- ------

The information is complete, all operations of which the Bureau of Mines has record as producing in 1927 being accounted for.

As these statistics include nonrevenue railroad fuel, they may differ from those compiled by the railroad companies, which often show only revenue freight and include coal received from connecting lines or coal shipped off the Lake docks, as well as that originating at mines on the lines reporting.

Where the road serving the district is a subsidiary of a larger road, some operators may report their coal as loaded on the subsidiary and others as loaded on the parent system. In general, the figures shown here appear under the name reported by the operator, and the bureau does not attempt to combine them by systems, believing that such combinations can best be made by the persons using the figures, who are usually familiar with coal-traffic problems. To approximate the total for the Southern system, for example, the reader should add to the total shown for the Southern Railway the figures for the Alabama Great Southern; Northern Alabama; Cincinnati, New Orleans & Texas Pacific; and Harriman & Northeastern lines. If such a combination is made the total will usually be found to check reasonably with the statistics issued by such railroads as keep records of total coal originated.

A few subsidiaries only have been consolidated under the name of the parent road. The shipments over the Coal & Coke Railroad have been included under the Baltimore & Ohio; and those over the Vandalia; the Pittsburgh, Cincinnati, Chicago & St. Louis; the Pennsylvania Co.; the Ohio River & Western; and the Wheeling Terminal have been included under the Pennsylvania system. The Chicago, Terre Haute & Southeastern, over which operators of Indiana reported as shipping in 1920, was leased in 1921 by the Chicago, Milwaukee, St. Paul, & Pacific Railway, and the two are shown combined for 1927 under the name of the latter road.

The figures for the Chicago & Eastern Illinois Railroad include coal loaded in cars of the Elgin, Joliet & Eastern and moved by the latter road over the rails of the Chicago & Eastern Illinois under a trackage agreement.

The Kanawha & Michigan, Toledo & Ohio Central, and Zanesville & Western are shown separately when so reported, rather than in combination with the New York Central, although it is apparent that many operators, served by these subsidiaries, have reported the name of the parent road.

The quantities shown in the following table, as shipped by waterways, do not all agree with statistics on river traffic published by the United States Engineer office. In partial explanation, it should be remembered that shipments of coal loaded in cars at the mines and later transferred to boats would be classified by the Bureau of Mines as "rail" and by the Engineer office as "river." Thus, the considerable tonnage moved down the Ohio from Huntington, W. Va., to Cincinnati by the Island Creek Coal Co., although properly appearing in the Engineer office figures of total traffic on the Ohio, is credited by the Bureau of Mines to the Chesapeake & Ohio Railroad, which hauls coal from the company's mines in Logan County to its pier at Huntington.

TABLE 64.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1927, in net tons*

Route	State	Quantity	
		By State	Total for route
RAILROADS			
Alabama Central	Alabama	71,993	71,993
Alabama Great Southern	do	139,429	139,429
Alaska	Alaska	98,042	98,042
Arkansas Western	Arkansas	13,459	13,459
Artemus Jellico	Kentucky	105,718	105,718
Atchison, Topeka & Santa Fe	Colorado	697,278	3,862,471
	Illinois	325,128	
	Kansas	597,229	
	Missouri	353,916	
	New Mexico	1,794,655	
	Oklahoma	94,265	
Atlanta, Birmingham & Coast	Alabama	26,931	26,931
Ballard & Thompson	Utah	116,892	116,892
Baltimore & Ohio	Illinois	963,102	40,035,653
	Indiana	174,596	
	Maryland	39,820	
	Ohio	2,526,457	
	Pennsylvania	10,241,264	
	West Virginia	26,090,414	
Bessemer & Lake Erie	Pennsylvania	1,897,939	1,897,939
Bevier & Southern	Missouri	10,479	10,479
Big Sandy & Cumberland	Kentucky	12,029	12,029
Big Sandy & Kentucky River	do	228,908	228,908
Buffalo & Susquehanna	Pennsylvania	970,089	970,089
Buffalo Creek & Gauley	West Virginia	737,843	737,843
Buffalo, Rochester & Pittsburgh	Pennsylvania	6,650,936	6,650,936
Cambria & Indiana	do	2,881,926	2,881,926
Campbell's Creek	West Virginia	814,805	814,805
Carbon County	Utah	328,843	328,843
Caseyville	Illinois	126,628	126,628
Central of Georgia	Alabama	1,133,738	1,205,821
	Georgia	72,083	
Chaffee	Maryland	93,981	93,981
Cheat Haven & Bruceton	West Virginia	62,250	62,250
Chesapeake & Ohio (includes Long Fork)	Kentucky	9,030,833	56,081,603
	West Virginia	47,050,770	
Cheswick & Harmar	Pennsylvania	290,465	290,465
Chicago & Alton	Illinois	1,257,626	1,323,196
	Missouri	65,570	
Chicago & Eastern Illinois	Illinois	1,245,732	4,115,350
	Indiana	2,869,618	
Chicago & Illinois Midland	Illinois	2,039,570	2,039,570
Chicago & North Western	do	1,975,422	2,300,802
	Iowa	227,941	
	Wyoming	97,439	
Chicago, Burlington & Quincy	Colorado	387,235	11,026,173
	Illinois	8,732,468	
	Iowa	177,341	
	Missouri	221,625	
	Wyoming	1,507.504	

TABLE 64.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1927, in net tons*—Continued

Route	State	Quantity	
		By State	Total for route
RAILROADS—continued			
Chicago Great Western	Iowa	91, 577	91, 577
Chicago, Indianapolis & Louisville	Indiana	1, 302, 905	1, 302, 905
Chicago, Milwaukee, St. Paul & Pacific	Illinois	83, 475	6, 067, 541
	Indiana	4, 198, 242	
	Iowa	483, 248	
	Missouri	48, 781	
	Montana	1, 144, 310	
	North Dakota	92, 178	
	South Dakota	2, 925	
	Washington	14, 382	
Chicago, Rock Island & Gulf	Texas	40, 019	40, 019
Chicago, Rock Island & Pacific	Colorado	14, 935	1, 945, 718
	Illinois	16, 394	
	Iowa	678, 808	
	Missouri	53, 789	
	Oklahoma	1, 181, 792	
Chicago, Springfield & St. Louis	Illinois	447, 405	447, 405
Cincinnati, New Orleans & Texas Pacific	Kentucky	62, 391	108, 287
	Tennessee	45, 896	
Cleveland, Cincinnati, Chicago & St. Louis	Illinois	3, 912, 480	5, 058, 835
	Indiana	1, 146, 355	
Clinchfield	Kentucky	74, 870	2, 375, 860
	Virginia	2, 300, 990	
Colorado & Southeastern	Colorado	453, 908	453, 908
Colorado & Southern	do	1, 900, 320	1, 900, 320
Colorado & Wyoming	do	438, 521	438, 521
Conemaugh & Black Lick	Pennsylvania	294, 087	294, 087
Crystal River & San Juan	Colorado	2, 527	2, 527
Cumberland & Pennsylvania	Maryland	1, 472, 707	1, 472, 707
Dardanelle & Russellville	Arkansas	58, 091	58, 091
Dents Run	Pennsylvania	16, 500	16, 500
Denver & Intermountain	Colorado	43, 709	43, 709
Denver & Rio Grande Western	do	2, 563, 648	4, 912, 291
	New Mexico	13, 770	
	Utah	2, 334, 873	
Denver & Salt Lake	Colorado	864, 917	864, 917
Des Moines & Central Iowa	Iowa	140, 588	140, 588
Detroit, Toledo & Ironton	Ohio	11, 644	11, 644
East Broad Top Railroad & Coal Co	Pennsylvania	324, 218	324, 218
Eastern Kentucky	Kentucky	19, 053	19, 053
Eastern Railway & Lumber Co	Washington	9, 382	9, 382
East St. Louis & Suburban	Illinois	144, 892	144, 892
Elgin, Joliet & Eastern	do	1, 767, 029	1, 767, 029
El Paso & Southwestern	New Mexico	943, 524	943, 524
Erbacon & Summerville	West Virginia	12, 875	12, 875
Erie	Ohio	38, 957	557, 607
	Pennsylvania	518, 650	
Evansville & Ohio Valley	Indiana	137, 335	137, 335
Evansville, Indianapolis & Terre Haute	do	2, 649, 444	2, 649, 444
Evansville, Suburban & Newburgh	do	229, 682	229, 682
Federal Valley	Ohio	939	939
Fort Dodge, Des Moines & Southern	Iowa	739	739
Fort Smith & Western	Oklahoma	157, 516	157, 516
Fort Smith, Subiaco & Rock Island	Arkansas	29, 188	29, 188
Great Northern	Montana	169, 058	736, 978
	North Dakota	302, 439	
	Washington	265, 481	
Greenbrier & Eastern	West Virginia	1, 548, 287	1, 548, 287
Greenbrier, Cheat & Elk	do	22, 725	22, 725
Harriman & Northeastern	Tennessee	191, 889	191, 889
Hocking Valley	Ohio	1, 318, 084	1, 318, 084
Houston & Texas Central	Texas	65, 153	65, 153
Huntingdon & Broad Top Mountain Railroad & Coal Co	Pennsylvania	533, 851	533, 851
Illinois Central	Alabama	211, 016	21, 537, 722
	Illinois	7, 807, 286	
	Indiana	534, 194	
	Kentucky	12, 985, 226	
Illinois Terminal	Illinois	26, 000	26, 000
Illinois Traction	do	558, 038	558, 038
Indian Creek Valley	Pennsylvania	137, 997	137, 997
International & Great Northern	Texas	163, 250	163, 250
Interstate	Kentucky	75, 566	2, 936, 045
	Virginia	2, 860, 479	
Iowa Southern Utilities Co	Iowa	60, 613	60, 613
Jefferson Southwestern	Illinois	36, 007	36, 007
Johnstown & Stony Creek	Pennsylvania	164, 264	164, 264
Joplin & Pittsburg	Kansas	280, 355	280, 355

TABLE 64.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1927, in net tons*—Continued

Route	State	Quantity	
		By State	Total for route
RAILROADS—continued			
Kanawha & Michigan (see also New York Central)	Ohio	24,656	320,627
	West Virginia	295,971	
Kanawha Central	do	223,912	223,912
Kanawha, Glen Jean & Eastern	do	1,228,981	1,228,981
Kansas City, Clay County & St. Joseph	Missouri	7,386	7,386
Kansas City Southern	Kansas	228,385	691,713
	Missouri	359,718	
	Oklahoma	103,610	
Kansas, Oklahoma & Gulf	do	180,212	180,212
Kelly Creek & Northwestern	West Virginia	1,237,364	1,237,364
Kentucky & Tennessee	Kentucky	915,748	915,748
Kentucky, Rockcastle & Cumberland	do	17,300	17,300
Lake Erie, Franklin & Clarion	Pennsylvania	327,195	327,195
Laramie, North Park & Western	Colorado	61,726	61,726
Ligonier Valley	Pennsylvania	505,828	505,828
Litchfield & Madison	Illinois	599,321	599,321
Louisiana Railway & Navigation Co. of Texas	Texas	17,292	17,292
Louisville & Nashville	Alabama	4,443,989	41,560,795
	Illinois	345,421	
	Kentucky	35,420,612	
	Tennessee	1,055,723	
	Virginia	295,050	
Louisville, Henderson & St. Louis	Kentucky	174,493	174,493
Marion & Eastern	Illinois	368,871	368,871
Michigan Central	Michigan	430,197	430,197
Midland Valley	Arkansas	186,524	512,043
	Oklahoma	325,519	
Minneapolis & St. Louis	Illinois	390,060	541,960
	Iowa	151,900	
Minneapolis, St. Paul & Sault Ste. Marie	North Dakota	283,059	283,059
Missouri-Illinois	Illinois	261,183	261,183
Missouri-Kansas-Texas	Kansas	77,299	890,106
	Missouri	116,893	
	Oklahoma	558,463	
	Texas	137,451	
Missouri Pacific	Arkansas	1,048,640	5,616,844
	Illinois	3,265,046	
	Kansas	645,775	
	Missouri	657,383	
Mobile & Ohio	Alabama	738,683	1,040,464
	Illinois	301,781	
Monongahela	Pennsylvania	7,665,018	16,405,455
	West Virginia	8,740,437	
Montana	Arkansas	40,364	40,364
Montana, Wyoming & Southern	Montana	408,579	408,579
Montour	Pennsylvania	3,288,563	3,288,563
Morgantown & Kingwood	West Virginia	2,804	2,804
Nashville, Chattanooga & St. Louis	Alabama	383	938,535
	Tennessee	938,152	
New Mexico Midland	New Mexico	59,117	59,117
New York Central (includes some coal shipped over subsidiary roads: Kanawha & Michigan, Kanawha & West Virginia, Toledo & Ohio Central, and Zanesville & Western).	Ohio	2,575,530	9,762,704
	Pennsylvania	4,481,853	
	West Virginia	2,705,321	
New York, Chicago & St. Louis	Illinois	299,307	299,807
	Indiana	500	
Norfolk & Western	Kentucky	5,422,761	40,149,458
	Virginia	3,421,101	
	West Virginia	31,305,596	
Norfolk Southern	North Carolina	48,535	48,535
Northern Alabama	Alabama	376,876	376,876
Northern Ohio Traction & Light Co	Ohio	13,262	13,262
Northern Pacific	Montana	1,241,990	3,379,580
	North Dakota	535,495	
	Washington	1,602,095	
Norton & Northern	Virginia	80,465	80,465
Ohio & Kentucky	Kentucky	10,739	10,739
Oklahoma City-Ada-Atoka	Oklahoma	100,740	100,740
Oneida & Western	Tennessee	1,007	1,007
Oregon Short Line	Idaho	13,024	1,110,211
	Wyoming	1,097,187	
Oregon-Washington Railroad & Navigation Co	Washington	256,694	256,694
Pacific Coast	do	258,962	258,962
Pennsylvania (includes Ohio River & Western and Pittsburgh, Cincinnati, Chicago & St. Louis)	Illinois	798,429	54,245,551
	Indiana	2,145,844	
	Ohio	2,991,616	
	Pennsylvania	46,354,436	
	West Virginia	1,955,226	

TABLE 64.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1927, in net tons*—Continued

Route	State	Quantity	
		By State	Total for route
RAILROADS—continued			
Peoria & Pekin Union	Illinois	290,809	290,809
Peoria, Hanna City & Western	do	515,988	515,988
Pere Marquette	Michigan	266,623	266,623
Peru, La Salle & Deer Park	Illinois	64,796	64,796
Pittsburg & Shawmut	Pennsylvania	2,555,647	2,555,647
Pittsburg County	Oklahoma	6,737	6,737
Pittsburg, Shawmut & Northern	Pennsylvania	522,302	522,302
Pittsburgh & Lake Erie	do	4,140,880	4,140,880
Pittsburgh & Susquehanna	do	218,852	218,852
Pittsburgh & West Virginia (includes West Side Belt)	Ohio	521,810	2,894,774
	Pennsylvania	2,204,614	
	West Virginia	168,350	
Pittsburgh, Chartiers & Youghiogheny	Pennsylvania	312,657	312,657
Pittsburgh, Lisbon & Western	do	159,616	159,616
Preston	West Virginia	238,230	238,230
Puget Sound Electric	Washington	28,009	28,009
Quincy, Omaha & Kansas City	Missouri	10,684	10,684
Reynoldsville & Falls Creek	Pennsylvania	5,249	5,249
Rio Grande & Eagle Pass	Texas	33,940	33,940
Rio Grande Eastern	New Mexico	11,833	11,833
Rio Grande Southern	Colorado	22,279	22,279
Rockdale, Sandow & Southern	Texas	306,254	306,254
Rock Island Southern	Illinois	36,445	36,445
St. Louis & Belleville Electric	do	55,835	55,835
St. Louis & Hannibal	Missouri	12,682	12,682
St. Louis & O'Fallon	Illinois	483,488	483,488
St. Louis & Ohio River	do	149,417	149,417
St. Louis-San Francisco	Alabama	2,581,828	5,485,320
	Arkansas	139,064	
	Kansas	1,179,250	
	Missouri	595,747	
	Oklahoma	989,431	
St. Louis Southwestern	Texas	393,938	393,938
St. Louis, Troy & Eastern	Illinois	330,562	330,562
Sandy Valley & Elkhorn	Kentucky	2,085,581	2,085,581
Scott's Run	West Virginia	721,309	721,309
Sewell Valley	do	153,280	153,280
Sloss-Sheffield Steel & Iron Co	Alabama	631,336	631,336
Southern	do	4,194,892	11,710,533
	Illinois	608,858	
	Indiana	1,365,427	
	Kentucky	548,216	
	Tennessee	1,751,478	
	Virginia	3,241,662	
Southern Illinois Railway & Power Co	Illinois	25,593	25,593
Southern Pacific	Oregon	7,982	45,482
	Texas	37,500	
Strouds Creek & Muddlety	West Virginia	18,780	18,780
Susquehanna & New York	Pennsylvania	36,397	36,397
Tennessee	Tennessee	635,646	635,646
Tennessee Central	do	803,342	803,342
Tennessee Coal, Iron & Railroad Co	Alabama	2,868,802	2,868,802
Texas & Pacific	Texas	77,412	77,412
Texas Short Line	do	16,000	16,000
Thomas & Sayreton	Alabama	423,151	423,151
Toledo & Ohio Central (see also New York Central)	Ohio	236,694	236,694
Toledo, Peoria & Western	Illinois	110,830	110,830
Tonopah & Goldfield	Nevada	70	70
Toronto, Knoxville & Western	Ohio	172,831	172,831
Uintah	Colorado	9,982	9,982
Union	Pennsylvania	20,322	20,322
Union Pacific	Colorado	1,081,980	4,891,552
	Kansas	20,000	
	Utah	56,658	
	Wyoming	3,732,914	
Unity	Pennsylvania	400,554	400,554
Utah	Utah	1,726,537	1,726,537
Virginian	Virginia	34,584	10,611,676
	West Virginia	10,577,092	
Wabash	Illinois	1,801,393	2,021,835
	Iowa	134,033	
	Missouri	86,409	
Wabash, Chester & Western	Illinois	189,552	189,552
Washington Run	Pennsylvania	570,572	570,572
Western Allegheny	do	467,887	467,887
Western Maryland	Maryland	1,087,047	5,167,461
	Pennsylvania	607,466	
	West Virginia	3,472,948	

TABLE 64.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1927, in net tons*—Continued

Route	State	Quantity	
		By State	Total for route
RAILROADS—continued			
West Side Belt	Pennsylvania	(1)	(1)
West Virginia Northern	West Virginia	335,480	335,480
Wheeling & Lake Erie	Ohio	2,449,092	2,449,092
Winifrede	West Virginia	117,169	117,169
Woodward Iron Co	Alabama	952,207	952,207
Youngstown & Ohio River	Ohio	49,699	49,699
Zanesville & Western (see also New York Central)	do	111,354	111,354
Total railroad shipments		462,691,336	462,691,336
WATERWAYS			
Allegheny River	Pennsylvania	245,808	245,808
Black Warrior River	Alabama	85,611	85,611
Green River	Kentucky	96,252	96,252
Kanawha River	West Virginia	529,662	529,662
Missouri River	Missouri	45	45
Monongahela River	Pennsylvania	16,010,669	16,010,669
Muskingum River	Ohio	101,000	101,000
Ohio River	Kentucky	293,034	462,392
	Ohio	510	
	Pennsylvania	616	
	West Virginia	168,232	
Tradewater River	Kentucky	666	666
Total waterway shipments		17,532,105	17,532,105
Grand total, loaded at mines for shipment by railroads and waterways		480,223,441	480,223,441
Sold to local trade and used by employees		21,889,884	21,889,884
Used at mines for steam and heat		4,930,394	4,930,394
Made into coke at mines		10,719,633	10,719,633
Total production		517,763,352	517,763,352

[1] Included under Pittsburgh & West Virginia.

LAKE SHIPMENTS OF BITUMINOUS COAL

The Lake cargo movement in 1927 was the largest in the history of the Lake trade. The total quantity loaded into vessels at the Lake Erie piers, according to the Ore and Coal Exchange, was 34,302,230 tons, of which 1,450,549 tons was vessel fuel and 32,851,681 tons was cargo coal. Cargo dumpings exceeded those of 1926 by 4,692,605 tons and were 3,022,897 tons above the record of 29,828,784 tons established in 1923. The sharp increase in Lake cargo shipments in 1927 is explained by the labor suspension, which lasted from April 1 through the early part of October in most of the organized fields north of the Ohio River. Areas of the Middle West and Northwest that ordinarily relied on supplies of all-rail coal from the union fields turned to nonunion coal brought via the Lakes. This greatly stimulated the Lake movement. More than one-half of the gain in shipments in 1927 was made in April, when total loadings were 3,373,682 tons in comparison with 950,461 tons in the corresponding month of 1926. (See Table 65.)

TABLE 65.—*Bituminous coal loaded into vessels at Lake Erie ports, 1919–1927, in net tons* [1]

	Cargo coal	Vessel fuel	Total
1919	21,713,341	1,037,051	22,750,392
1920	22,408,355	1,258,783	23,667,138
1921	22,412,380	759,069	23,171,449
1922	18,522,142	829,181	19,351,323
1923	29,828,784	1,628,510	31,457,294
1924	22,974,991	1,347,561	24,322,552
1925	26,330,843	1,532,153	27,862,996
1926	28,159,076	1,584,778	29,743,854
1927:			
January	157,278	6,372	163,650
February	----------	----------	----------
March	354,818	16,039	370,857
April	3,255,355	118,327	3,373,682
May	5,178,253	211,604	5,389,857
June	5,038,188	217,848	5,256,036
July	4,262,849	198,878	4,461,727
August	3,967,116	199,235	4,166,351
September	3,686,702	181,922	3,868,624
October	3,577,612	173,800	3,751,412
November	3,166,432	114,599	3,281,031
December [2]	207,078	11,925	219,003
	32,851,681	1,450,549	34,302,230

[1] From records of the Ore and Coal Exchange.

[2] Figures include coal loaded into vessels for winter storage at Lake Erie ports.

Table 66 gives the destination of the cargo shipments of the last three years. A greater portion of the large increase in 1927 as compared with 1926 represents shipments to American ports. Shipments to Canada were 455,318 more than in 1926, but shipments to American ports on Lake Superior increased by 2,511,501 tons and to those on Lake Michigan by 1,072,285 tons.

TABLE 66.—*Destination of bituminous cargo coal dumped into vessels at Lake Erie ports in the seasons of 1925, 1926, and 1927* [1]

Destination	1925		1926		1927	
	Net tons	Per cent	Net tons	Per cent	Net tons	Per cent
American:						
Lake Superior ports	10,841,678	41.2	11,214,652	39.9	13,726,153	41.7
Sault Ste. Marie and river points	618,014	2.4	642,823	2.3	611,709	1.8
Lake Huron ports	341,829	1.3	425,675	1.5	496,784	1.5
Lake Michigan ports	8,203,007	31.2	9,085,163	32.3	10,157,448	30.9
Port Huron and Detroit River	1,135,954	4.3	1,144,282	4.1	1,416,150	4.3
Lake Eire ports	922,980	3.5	706,199	2.5	1,175,287	3.6
Lake Ontario and St. Lawrence River	61,976	.2	13,267	.1	2,195	------
Total American	22,125,438	84.1	23,232,061	82.7	27,585,726	83.8
Canadian:						
Lake Superior ports	806,856	3.1	1,105,632	3.9	1,461,135	4.4
Sault Ste. Marie and river points	591,432	2.2	918,260	3.3	1,032,313	3.1
Lake Huron-Georgian Bay ports	683,151	2.6	903,368	3.2	937,719	2.9
Port Huron and Detroit River	653,404	2.5	701,420	2.5	583,720	1.8
Lake Erie ports	568,717	2.2	638,233	2.3	848,400	2.6
Lake Ontario and St. Lawrence River	874,720	3.3	593,784	2.1	452,728	1.4
Total Canadian	4,178,280	15.9	4,860,697	17.3	5,316,015	16.2
Grand total	26,303,718	100.0	28,092,758	100.0	32,901,741	100.0

[1] From records of the Ore and Coal Exchange. As these figures represent movement of vessels away from the ports they do not agree exactly with the total loaded into vessels because at the end of the season some coal is dumped into vessels for storage during the winter and shipment up the Lakes the following year.

The origin by districts of the cargo coal shipped in 1927 is shown in Table 67, compiled from data furnished by the Ohio Bureau of Coal Statistics. It is worthy to note that the coal fields of West Virginia, eastern Kentucky, and Virginia received all the increase in the Lake trade in 1927. The Lake cargo tonnage originated in West Virginia alone exceeded that of 1926 by 5,839,508 tons. Tennessee and the districts north of the Ohio River suffered a loss in Lake business. As the accompanying table is based on railroad records of the coal as billed from the mines the total differs slightly from the total of dumpings at the ports given in Table 65. Corresponding figures for each year from 1910 to 1918 are given in Coal in 1918, Part B, page 1329. Those for 1919 are given in Coal in 1926, page 511.

TABLE 67.—*Shipments of bituminous coal to Great Lakes ports for loading into vessels as cargo, by districts of origin, in the seasons of 1920–1927, in net tons* [1]

District	1920	1921	1922	1923	1924	1925	1926	1927
Eastern Kentucky	1,375,323	2,624,194	3,091,089	3,297,476	3,514,355	6,606,932	6,933,527	7,178,574
Ohio:								
Cambridge	778,776	981,997	615,736	954,867	1,005,498	4,381	68,181	1,402
Hocking	2,575,086	668,577	1,288,269	919,927	90,165	115,496	173,953	46,347
Northern Ohio	453,829	208,994	194,608	361,567	57,327	15,704	29,724	------------
No. 8	3,799,023	3,678,554	1,287,123	3,716,307	2,851,212	1,316,428	1,149,102	298,355
Pennsylvania:								
Altoona and Meyersdale	22,410	30,182	81,420	31,316	1,605	1,398	1,875	10,475
Connellsville	(2)	(2)	374,936	468,859	548,327	367,418	598,494	909,405
Northern Pennsylvania	1,044,579	723,819	832,339	1,081,927	482,484	5,096	825,487	145,498
Pittsburgh	[2] 6,203,444	[2] 5,907,489	4,002,214	7,977,903	3,249,209	2,106,587	2,506,685	2,547,716
West Virginia:								
Cumberland-Piedmont	21,459	4,352	676	796	5,146	4,023	3,030	------------
Fairmont	[3] 1,284,041	[3] 1,014,514	[3] 1,369,969	[3] 3,169,505	[3] 1,404,159	1,623,499	2,141,924	3,877,170
Kanawha	3,020,946	3,687,136	2,671,251	4,581,656	5,754,567	7,803,062	7,548,932	9,457,380
Moundsville	(3)	(3)	(3)	(3)	(3)	760,614	326,877	728,315
New River	233,633	208,890	271,630	448,566	353,049	396,091	431,301	712,747
Pocahontas	1,434,183	2,430,559	1,665,556	2,445,507	2,630,625	3,295,537	3,404,807	4,096,952
Thacker-Kenova	143,645	190,911	761,962	383,016	977,870	1,794,479	1,595,598	2,099,995
Winding Gulf					------------	------------	280,452	599,870
Tennessee	185	3,731	25,667	------------	55,248	17,562	82,629	43,573
Virginia	92	------------	43,208	723	202	98,877	59,921	104,519
	22,390,654	22,363,899	18,577,653	29,839,918	22,981,048	26,333,184	28,162,499	32,858,293

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[1] From records of Ohio Bureau of Coal Statistics.

[2] Figures for Connellsville included with Pittsburgh before 1922.

[3] Figures for Moundsville included with Fairmont before 1925.

LAKE SHIPMENTS OF ANTHRACITE

The movement of anthracite up the Great Lakes is handled through the ports of Buffalo and Erie. From 1918 to 1921 the total shipments averaged more than 4,000,000 net tons a year. In late years, however, there has been a notable decline in the movement of hard coal up the Lakes. (See Table 68.) Shipments in 1927 were 1,918,389 net tons, a smaller tonnage than for any year free from labor difficulties in the past decade.

Figures showing the shipments of anthracite, by months, at Lake Erie ports for each year from 1918 to 1926 are given in Coal in 1926, page 512.

TABLE 68.—*Anthracite cargo coal loaded into vessels at Lake Erie ports, 1919–1927, in net tons* [1]

	Buffalo	Erie	Total
1919	4. 080, 334	455, 354	4, 535, 688
1920	3, 602, 351	430, 638	4, 032, 989
1921	3, 844, 261	421, 453	4, 265, 714
1922	1, 182, 326	199, 620	1, 381, 946
1923	3, 091, 406	420, 673	3, 512, 079
1924	2, 709, 854	384, 234	3, 094, 088
1925	1, 549, 858	243, 658	1, 793, 516
1926	2, 347, 826	510, 091	2, 857, 917
1927:			
January	----------	----------	----------
February	33, 749	----------	33, 749
March	119, 040	10, 263	129, 303
April	42, 823	39, 370	82, 193
May	108, 116	97, 238	205, 354
June	272, 103	70, 132	342, 235
July	115, 824	36, 616	152, 440
August	185, 118	57, 040	242, 158
September	201, 130	56, 589	257, 719
October	206, 145	70, 991	277, 136
November	136, 975	47, 638	184, 613
December	----------	11, 489	11, 489
	1, 421, 023	497, 366	1, 918, 389

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[1] From records of Ore and Coal Exchange.

RECEIPTS AT HEAD OF LAKE SUPERIOR

The quantity of anthracite received at Duluth-Superior Harbor in the season of 1927 was 981,194 net tons, a loss of 22.9 per cent from 1926. Receipts of bituminous coal, which amounted to 11,452,444 tons in 1927, were the largest in the history of the port and showed a substantial increase over each of the past three years. The following table is compiled from the records of the United States Engineer office at Duluth:

TABLE 69.—*Receipts of coal at Duluth-Superior Harbor, 1919–1927, in net tons* [1]

	Anthracite	Bituminous coal	Total
1919	1,795,257	7,079,840	8,875,097
1920	1,637,477	7,393,219	9,030.696
1921	1,844,642	8,320,207	10,164,849
1922	566,362	5,138,934	5,705,296
1923	1,419,984	11,268,337	12,688,321
1924	1,289,994	7,730,878	9,020,872
1925	790,132	8,882,569	9,672,701
1926	1,272,973	9,168,656	10,441,629
1927:			
April	44,900	1,038,302	1,083,202
May	174,596	2,267,056	2,441,652
June	127,702	1,942,004	2,069,706
July	86,371	1,713,646	1,800,017
August	112,737	1,383,846	1,496,583
September	168,137	1,210,364	1,378,501
October	178,217	1,015,459	1,193,676
November	78,488	796,835	875,323
December	10,046	84,932	94,978
	981,194	11,452,444	12,433,638

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[1] From records of United States Engineer office, Duluth, Minn.

TIDEWATER BITUMINOUS COAL SHIPMENTS

The quantity of bituminous coal handled at tidewater piers in 1927 was 34.3 per cent below the tonnage handled in 1926, when the export trade was greatly stimulated by the British strike. The total dumped at the five ports—New York, Philadelphia, Baltimore, Hampton Roads, and Charleston (S. C.)—was 37,838,612 net tons. A small business is done at piers at other ports in New England and on the South Atlantic, Gulf, and Pacific coasts; but, as shown by a detailed study made in 1918, the quantity handled at these other ports amounted to only 4.1 per cent of the total. For practical purposes, therefore, dumpings at the five Atlantic ports mentioned may be taken as the tidewater coal trade of the United States.

In comparison with 1926 the dumpings in 1927 show a decrease of about 20,000,000 tons. As indicated above, most of this loss is explained by a falling off in the export demand. In 1927 tidewater ports loaded only 3,579,575 net tons for export in comparison with 21,900,304 tons in 1926.

Table 70 summarizes the tidewater movement by ports and destinations. As the figures on exports are based on records kept by the railroads operating the piers they differ slightly from the official statistics of exports as kept by the customs service, which represent vessel clearances from the port. The differences, however, are slight, and the export figures reported by the railroads are used here because they are comparable with the dumpings for other destinations given in the table.

TABLE 70.—*Total tidewater shipments of bituminous coal, by years, 1920–1927, in net tons*

	1920	1921	1922	1923	1924	1925	1926	1927
By destinations:								
Coastwise to New England	10, 456, 444	8, 858, 631	10, 892, 460	13, 374, 320	11, 488, 230	13, 463, 462	12, 948, 939	14, 828, 981
Exports	21, 778, 206	9, 632, 688	1, 613, 390	5, 121, 654	4, 767, 887	5, 109, 491	21, 900, 304	3, 579, 575
Bunker	9, 171, 070	8, 135, 342	4, 576, 039	5. 442, 123	4, 961, 330	5, 487, 857	8, 544, 538	5, 708, 661
Inside capes	3, 410, 301	3, 251, 114	3, 331, 706	4, 459, 659	3, 752, 868	4, 347, 956	4, 373, 071	4, 200, 804
Other tonnage	8, 968, 161	7, 445, 338	8, 058, 915	9, 122, 751	8, 246, 438	8, 714, 972	9, 807, 646	9, 520, 591
	53, 784, 182	37, 323, 113	28, 472, 510	37, 520, 507	33, 216, 753	37, 123, 738	57, 574, 498	37, 838, 612
By ports:								
New York	14, 824, 912	11, 911, 974	7, 439, 431	10, 799, 410	9, 004, 960	9, 230, 448	10, 336, 698	9, 031, 032
Philadelphia	6, 191, 667	3, 640, 987	2, 157, 224	3, 892, 868	2, 876, 760	3, 107, 925	5, 446, 962	3, 232, 355
Baltimore	7, 830, 813	4, 136, 368	1, 916, 763	5, 067, 979	3, 062, 834	3, 430, 054	10, 352, 835	3, 462, 980
Hampton Roads	24, 025, 787	17, 241, 422	16, 627, 009	17, 384, 484	18, 094, 077	21, 113, 240	30, 716, 282	21, 791, 796
Charleston	911, 003	392, 362	332, 083	375, 766	178, 122	242, 071	721, 721	320, 449
	53, 784, 182	37, 323, 113	28, 472, 510	37, 520, 507	33, 216, 753	37, 123, 738	57, 574, 498	37, 838, 612

Table 71 continues the analysis by showing the distribution of the tonnage handled at each port. It indicates that Hampton Roads is the dominant source of the coastwise movement to New England, and that Hampton Roads and Baltimore are now the chief centers of the sea-borne export trade. New York is an important supplier of bunker coal. The item of "inside capes" for the port of Philadelphia refers to coal dumped into barges and moved to points inside the capes of the Delaware. Similarly, the items "inside capes" at Baltimore and Hampton Roads refer to coal moved by barge or other vessel to points within the capes at the entrance of Chesapeake Bay. The large item "other tonnage" at New York probably includes some coal later delivered for ships' bunkers at other points in New York Harbor but consists principally of coal consigned to the many large plants equipped to receive coal by water in and around New York and northern New Jersey. At Hampton Roads the item of "other tonnage" includes coal for the Navy and coastwise shipments to points outside New England—among others, to Panama.

TABLE 71.—*Summary of tidewater shipments of bituminous coal, by ports and destinations, in 1927, in net tons*

Destination	New York	Philadelphia	Baltimore	Hampton Roads	Charleston	Total
Coastwise to New England	865, 272	626, 019	748, 119	12, 589, 571		14, 828, 981
Exports	3, 370	352, 386	404, 680	2, 588, 903	230, 236	3, 579, 575
Bunker	2, 777, 548	360, 125	237, 034	2, 246, 150	87, 804	5, 708, 661
Inside capes		1, 873, 198	2, 029, 566	298, 040		4, 200, 804
Other tonnage	5, 384, 842	20, 627	43, 581	4, 069, 132	2, 409	9, 520, 591
	9, 031, 032	3, 232, 355	3, 462, 980	21, 791, 796	320, 449	37, 838, 612

Tables 72 and 73 give details of the tidewater dumpings for each month of 1927. They show a sharp drop from the figure of more than 6,500,000 tons handled by the piers during each of the last three months of 1926.

TABLE 72.—*Monthly tidewater shipments of bituminous coal, by destinations, in 1927, in net tons*

Month	New England	Exports	Bunker	Inside capes	Other tonnage	Total
January	1, 412, 649	803, 717	561, 449	443, 818	827, 924	4, 049, 557
February	1, 432, 921	383, 528	432, 452	441, 627	901, 806	3, 592, 334
March	1, 665, 433	360, 708	540, 687	440, 611	981, 474	3, 988, 913
April	1, 197, 958	294, 993	485, 029	354, 975	782, 767	3, 115, 722
May	1, 185, 929	161, 148	421, 762	344, 784	733, 066	2, 846, 689
June	1, 154, 947	215, 931	461, 735	328, 709	684, 986	2, 846, 308
July	1, 173, 874	206, 808	437, 576	270, 278	727, 049	2, 815, 585
August	1, 173, 963	226, 881	485, 232	358, 420	754, 318	2, 998, 814
September	1, 192, 514	239, 900	448, 410	304, 799	720, 568	2, 906, 191
October	1, 136, 337	239, 449	494, 160	301, 842	797, 001	2, 968, 789
November	996, 439	221, 389	463, 910	300, 187	792, 725	2, 774, 650
December	1, 106, 017	225, 123	476, 259	310, 754	816, 907	2, 935, 060
	14, 828, 981	3, 579, 575	5, 708, 661	4, 200, 804	9, 520, 591	37, 838, 612

TABLE 73.—*Monthly tidewater shipments of bituminous coal, by ports, in 1927, in net tons*

Month	New York	Philadelphia	Baltimore	Hampton Roads	Charleston	Total
January	817, 309	455, 889	490, 333	2, 220, 823	65, 203	4, 049, 557
February	806, 021	364, 468	368, 082	2, 006, 344	47, 419	3, 592, 334
March	967, 168	352, 545	371, 211	2, 252, 180	45, 809	3, 988, 913
April	730, 258	240, 289	304, 101	1, 818, 509	22, 565	3, 115, 722
May	652, 654	216, 210	252, 347	1, 711, 244	14, 234	2, 846, 689
June	689, 945	229, 024	267, 606	1, 634, 251	25, 482	2, 846, 308
July	646, 486	202, 030	215, 504	1, 739, 304	12, 261	2, 815, 585
August	731, 240	234, 594	263, 704	1, 753, 021	16, 255	2, 998, 814
September	711, 446	235, 172	228, 629	1, 713, 272	17, 672	2, 906, 191
October	741, 177	229, 430	244, 651	1, 741, 333	12, 198	2, 968, 789
November	737, 202	232, 975	227, 751	1, 554, 862	21, 860	2, 774, 650
December	800, 126	239, 729	229, 061	1, 646, 653	19, 491	2, 935, 060
	9, 031, 032	3, 232, 355	3, 462, 980	21, 791, 796	320, 449	37, 838, 612

NEW ENGLAND MOVEMENT

New England is supplied with coal partly by coastwise shipments from the principal coal ports and partly by all-rail shipments across the Hudson. Coal may also be obtained by sea from other countries, but under ordinary conditions of the market the quantity imported is small. The origin of the coastwise shipments in 1927 is shown in the preceding tables (Nos. 71 and 73), and in the bureau's weekly coal report will be found a current record of the cars of coal, both anthracite and bituminous, forwarded to New England through the rail gateways of Harlem River, Maybrook, Albany, Rotterdam, Mechanicsville, and Rouses Point. Tables 74 and 75 show the quantities actually received in New England, according to records maintained by the Massachusetts Special Commission on the Necessaries of Life.

Table 74 traces the volume of the supplies reaching New England during each month of 1926 and 1927. With the exception of January, February, and August, monthly receipts of anthracite were lower in 1927 than in 1926. The shortage of domestic fuel caused by the anthracite suspension ended in February, 1926, stimulated the New England market in the following months to a degree not experienced in 1927. Monthly receipts of bituminous coal ran ahead of those in 1926 for the first nine months. From October to December, however, they were considerably behind the corresponding months in the preceding year.

TABLE 74.—*Receipts of coal in New England, by months, 1926 and 1927, in net tons*[1]

	Anthracite			Bituminous		
	By tidewater	All-rail	Total	By tidewater	All-rail	Total
1926						
January	93, 989	17, 771	111, 760	1, 162, 608	691, 156	1, 853, 764
February	104, 070	37, 355	141, 425	1, 052, 500	718, 727	1, 771, 227
March	340, 039	799, 239	1, 139, 278	1, 475, 757	905, 403	2, 381, 160
April	312, 795	695, 098	1, 007, 893	1, 121, 533	479, 249	1, 600, 782
May	290, 982	746, 705	1, 037, 687	1, 014, 553	491, 867	1, 506, 420
June	285, 202	788, 776	1, 073, 978	952, 251	470, 170	1, 422, 421
July	305, 408	752, 134	1, 057, 542	850, 975	479, 961	1, 330, 936
August	266, 135	697, 784	963, 919	945, 286	579, 958	1, 525, 244
September	268, 584	713, 306	981, 890	1, 026, 660	607, 986	1, 634, 646
October	314, 419	833, 143	1, 147, 562	1, 075, 126	679, 778	1, 754, 904
November	266, 696	844, 091	1, 110, 787	1, 150, 366	921, 451	2, 071, 817
December	224, 872	609, 089	833, 961	1, 194, 495	1, 019, 077	2, 213, 572
	3, 073, 191	7, 534, 491	10, 607, 682	13, 022, 110	8, 044, 783	21, 066, 893
1927						
January	129, 839	406, 219	536, 058	1, 464, 580	897, 687	2, 362, 267
February	94, 722	343, 571	438, 293	1, 522, 580	897, 106	2, 419, 686
March	127, 404	316, 571	443, 975	1, 706, 617	914, 817	2, 621, 434
April	210, 314	446, 353	656, 667	1, 320, 780	451, 597	1, 772, 377
May	293, 471	702, 969	996, 440	1, 163, 934	450, 831	1, 614, 765
June	238, 699	689, 927	928, 626	1, 155, 534	508, 812	1, 664, 346
July	174, 188	552, 644	726, 832	1, 178, 569	450, 639	1, 629, 208
August	249, 324	714, 615	963, 939	1, 146, 706	523, 932	1, 670, 638
September	248, 266	635, 253	883, 519	1, 140, 767	537, 846	1, 678, 613
October	222, 255	680, 567	902, 822	1, 150, 302	548, 468	1, 698, 770
November	229, 119	713, 170	942, 289	1, 087, 249	484, 603	1, 571, 852
December	202, 254	522, 868	725, 122	1, 070, 509	565, 566	1, 636, 075
	2, 419, 855	6, 724, 727	9, 144, 582	15, 108, 127	7, 231, 904	22, 340. 031

The total receipts of anthracite in New England during 1927 were 9,145,000 net tons, of which 2,420,000 tons came by tide and 6,725,000 all-rail. The total receipts of bituminous coal were 22,340,000 tons, 15,108,000 tons coming by tide and 7,232,000 all-rail. Twenty-six and five-tenths per cent of the anthracite and 67.6 per cent of the bituminous coal thus came in by tidewater. With respect to anthracite, the per cent by tide showed a large decline in 1927 in contrast to the relatively small changes in other recent years. With respect to bituminous coal the proportion by tide has increased steadily from the 46.9 per cent in 1919. (See Table 75.) The unusually sharp increase in 1927, when receipts by tide established a new record, is partly explained by the suspension in the central competitive field which retarded all-rail shipments.

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[1] From records of Massachusetts Special Commission on Necessaries of Life.

Table 75.—*Receipts of coal in New England, by years, 1919–1927* [1]

	Anthracite			Bituminous		
	By tidewater	All-rail	Total	By tidewater	All-rail	Total
Net tons:						
1919	3, 310, 000	7, 268, 000	10, 578, 000	8, 527, 000	9, 655, 000	18, 182, 000
1920	3, 521, 000	7, 734, 000	11, 255, 000	10, 211, 000	12, 223, 000	22, 434, 000
1921	3, 695, 000	7, 679, 000	11, 374, 000	8, 814, 000	8, 374, 000	17, 188, 000
1922	2, 060, 000	4, 411, 000	6, 471, 000	12, 996, 000	5, 812, 000	18, 808, 000
1923	4, 082, 000	8, 103, 000	12, 185, 000	14, 050, 000	9, 634, 000	23, 684, 000
1924	3, 325, 000	7, 286, 000	10, 611, 000	11, 892, 000	6, 985, 000	18, 877, 000
1925	2, 544, 000	5, 736, 000	8, 280, 000	13, 557, 000	7, 756, 000	21, 313, 000
1926	3, 073, 000	7, 535, 000	10, 608, 000	13, 022, 000	8, 045, 000	21, 067, 000
1927	2, 420, 000	6, 725, 000	9, 145, 000	15, 108, 000	7, 232, 000	22, 340, 000
Per cent:						
1919	31. 3	68. 7	100. 0	46. 9	53. 1	100. 0
1920	31. 3	68. 7	100. 0	45. 5	54. 5	100. 0
1921	32. 5	67. 5	100. 0	51. 3	48. 7	100. 0
1922	31. 8	68. 2	100. 0	69. 1	30. 9	100. 0
1923	33. 5	66. 5	100. 0	59. 3	40. 7	100. 0
1924	31. 3	68. 7	100. 0	63. 0	37. 0	100. 0
1925	30. 7	69. 3	100. 0	63. 6	36. 4	100. 0
1926	29. 0	71. 0	100. 0	61. 8	38. 2	100. 0
1927	26. 5	73. 5	100. 0	67. 6	32. 4	100. 0

[1] From records of Massachusetts Special Commission on the Necessaries of Life.

The change in the sources of New England's supply of bituminous coal has led to many requests upon the bureau for more detailed information on the subject; to meet these Table 76 has been prepared. The table shows by months for 1926 and 1927 the quantity received in New England all-rail and the quantity dispatched to New England by coastwise vessels from each of the four coal ports. Corresponding data for 1919 to 1925 are given in Coal in 1926, pages 518–519. The outstanding features of this record are the rise in the coastwise movement coincident with the decline of the all-rail shipments and the growth of the movement from Hampton Roads at the expense of that from New York. The labor difficulties in certain fields north of the Ohio River already mentioned helped to accentuate these trends in 1927.

TABLE 76.—*Monthly coastwise shipments of bituminous coal to New England from Hampton Roads, Baltimore, Philadelphia, and New York and monthly receipts of bituminous coal all-rail in New England, 1926–27, in net tons*

Year and month	Coastwise shipments to New England [1]					All-rail receipts in New England [2]
	Hampton Roads	Baltimore	Philadelphia	New York	Total, all ports	
1926						
January	976, 372	77, 937	35, 422	43, 709	1, 133, 440	691, 156
February	907, 968	60, 395	17, 054	46, 564	1, 031, 981	718, 727
March	1, 152, 540	97, 098	34, 524	86, 491	1, 370, 653	905, 403
April	862, 499	71, 394	30, 839	54, 950	1, 019, 682	479, 249
May	865, 234	76, 942	22, 900	68, 453	1, 033, 529	491, 867
June	710, 313	117, 047	20, 992	76, 900	925, 252	470, 170
July	711, 070	57, 605	24, 979	83, 453	877, 107	479, 961
August	749, 864	70, 859	46, 634	60, 765	928, 122	579, 958
September	806, 813	74, 005	69, 612	76, 953	1, 027, 383	607, 986
October	885, 307	90, 101	84, 173	105, 739	1, 165, 320	679, 778
November	860, 980	78, 810	53, 649	147, 456	1, 140, 895	921, 451
December	1, 016, 895	105, 279	51, 889	121, 512	1, 295, 575	1, 019, 077
	10, 505, 855	977, 472	492, 667	972, 945	12, 948, 939	8, 044, 783
1927						
January	1, 147, 280	96, 056	69, 036	100, 277	1, 412, 649	897, 687
February	1, 190, 950	86, 552	64, 244	91, 175	1, 432, 921	897, 106
March	1, 344, 143	112, 024	83, 045	126, 221	1, 665, 433	914, 817
April	1, 011, 451	50, 429	57, 098	78, 980	1, 197, 958	451, 597
May	1, 021, 218	58, 949	53, 780	51, 982	1, 185, 929	450, 831
June	983, 506	55, 919	49, 477	66, 045	1, 154, 947	508, 812
July	1, 042, 036	56, 364	22, 459	53, 015	1, 173, 874	450, 639
August	1, 031, 305	52, 325	29, 998	60, 335	1, 173, 963	523, 932
September	1, 040, 694	41, 603	47, 282	62, 935	1, 192, 514	537, 846
October	966, 412	58, 840	47, 479	63, 606	1, 136, 337	548, 468
November	845, 136	49, 402	51, 032	50, 869	996, 439	484, 603
December	965, 440	29, 656	51, 089	59, 832	1, 106, 017	565, 566
	12, 589, 571	748, 119	626, 019	865, 272	14, 828, 981	7, 231, 904

[1] Quantity loaded into vessels over tidewater piers as reported by railroads serving the ports indicated. No shipments were reported from Charleston in 1926 or 1927.

[2] From records of Massachusetts Special Commission on the Necessaries of Life.

IMPORTS AND EXPORTS [31]

IMPORTS

Under normal conditions of trade and production imports into the United States fluctuate but little from month to month or from year to year. They consist almost entirely of bituminous coal from Vancouver Island and Alberta received in Washington, Montana, and Idaho and of small quantities of coal brought to Pacific ports as ballast in vessels from Australia and Japan.

Imports of bituminous coal in 1927 were 550,000 net tons, which represented an increase of 13.2 per cent over 1926 and a decrease of 8.6 per cent from 1925. The labor suspension in the union fields had very little effect in stimulating the import movement. An increase of 22.1 per cent over 1926 is noted in shipments received from Canada. Receipts from the United Kingdom were slightly above those in 1924. Japan supplied a smaller tonnage than during any of the preceding four years.

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[31] The tables of imports and exports have been compiled by J. A. Dorsey, of the Bureau of Mines, from the records of the Bureau of Foreign and Domestic Commerce.

TABLE 77.—*Bituminous coal imported, by countries and districts, 1923–1927, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country and district	1923	1924	1925	1926	1927
COUNTRY OF ORIGIN					
North America:					
Canada	1,099,773	317,184	527,759	407,464	497,717
Mexico	9	26	150	250	212
Newfoundland and Labrador				5	
Salvador				1,120	
West Indies—					
British—					
Jamaica					112
Other					168
Cuba	133			37	
South America:					
Chile			2		
Peru	728				1
Venezuela				1	
Europe:					
Belgium	504			140	280
France	9	348	67	2	
Germany	538		450	632	
Italy			6		168
Netherlands			2,473	280	325
Poland and Danzig	1				
United Kingdom—					
England	545,587	7,951	} 40,228	38,330	30,407
Scotland	97,968	20,235			
Asia:					
China	2	146		10	
Hong Kong	9,860	1			
Japan	22,496	28,923	17,190	32,454	15,920
Kwantung, leased territory			25		
Philippine Islands	280		4		
Africa: Canary Islands					56
Oceania:					
Australia	89,877	39,923	10,919	4,941	4,477
New Zealand	14,541		2,464		
Other Oceania		2,489			
	1,882,306	417,226	601,737	485,666	549,843
DISTRICT OF ENTRY					
Alaska	43,204	41,980	47,230	30,581	30,481
Arizona				26	
Buffalo					113
Chicago				356	
Connecticut			48		
Dakota	12,624	85	11,524	10,483	9,741
Duluth-Superior	371		678	473	980
Florida		134	90	37	
Galveston				1,260	885
Hawaii	85,314	45,207	25,043	37,104	20,256
Los Angeles			29	632	
Maine and New Hampshire	261,338	46,808	19,304	50,533	49,344
Maryland	572			280	
Massachusetts	360,538		10,544	1,840	34
Michigan	344	112	6	437	47
Montana-Idaho	513,465	114,676	343,813	253,894	330,788
New Orleans					336
New York	239,369	4,561	10,518	230	4,502
Oregon	7,093	3,651	3,295	10	235
Philadelphia	22,515		2,271	675	
Pittsburgh	1	22			
Porto Rico					280
Rhode Island	65,295		5,962	7,155	
St. Lawrence		1,007	101	3,017	4,195
San Antonio	9	26	150	224	213
San Francisco	62,271	23,161	8,124	1,570	
South Carolina					280
Vermont		6	3	119	348
Washington	207,983	135,790	113,004	84,730	96,785
	1,882,306	417,226	601,737	485,666	549,843

In ordinary years the quantity of anthracite imported has been insignificant. However, in response to the shortage in domestic fuel caused by the long labor suspension in the hard-coal regions anthracite imports reached the record figure of 814,000 net tons in 1926. In 1927 imports fell to 119,000 tons, or about the same tonnage received in 1924. From Table 78 it will be seen that the largest share of the hard coal imported came from South Wales and Scotland. It is worthy of note that 89.2 per cent of the foreign anthracite imported in 1927 entered the New England States—Maine, New Hampshire, Massachusetts, Rhode Island, and Vermont—where it was sold in competition with the domestic product.

TABLE 78.—*Anthracite imported, by countries and districts, 1923–1927, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country and district	1923	1924	1925	1926	1927
COUNTRY OF ORIGIN					
Algeria and Tunisia	168				
Australia	11,828	1,836	4,480		
Belgium			5,684	27,910	
Brazil				2	
British West Indies (other)		4	12		
Canada	19,118	16,249	6,834	9,696	3,391
China	1,037		112		
Cuba			1		
France				2,779	
Germany			36,636	198,011	2
Japan		168	3,946	(1)	2,778
Mexico	99	94			
Netherlands		448	6,485	53,730	3,030
United Kingdom:					
England	253,828	99,152	318,592	521,827	109,829
Scotland	14,282				
Venezuela				1	
Virgin Islands of the United States			112		
	300,360	117,951	382,894	813,956	119,030
DISTRICT OF ENTRY					
Alaska				3	11
Buffalo	176	16	722	746	1,418
Connecticut	7,549			11,985	
Dakota	7,650	8,164	724	56	
Duluth-Superior	31	38	64	300	141
Florida			1		
Galveston					117
Hawaii			3,492		2,778
Los Angeles	220				
Maine and New Hampshire	35,505	22,524	47,543	135,408	24,014
Maryland	16,377	8,296		3,743	
Massachusetts	83,988	47,006	117,057	210,918	63,137
Michigan	571	317	58		170
Montana-Idaho	3,609	5,646	300		
New Orleans		7			
New York	98,048		145,168	393,930	4,490
Ohio				1	
Oregon	2,789	1,959			
Philadelphia	14,869		2,789	27,375	
Porto Rico		4	124		
Rhode Island	17,306	23,110	58,531	29,056	18,865
St. Lawrence	67		383	178	112
San Antonio	99	94			
San Francisco	9,180	493	4,934	9	2
South Carolina	224				
Vermont	235		892	92	143
Washington	1,867	277	112	156	3,632
	300,360	117,951	382,894	813,956	119,030

[1] Less than 1 ton.

EXPORTS

General features.—The exports of coal from the United States far exceed the imports. The quantity of anthracite exported is relatively constant—between 3,000,000 and 4,000,000 net tons a year, destined mainly for Canadian consumption. The exports of bituminous coal in recent years have ranged from 12,400,000 net tons in 1922 to 35,300,000 tons in 1926. In 1927 they were 18,012,000 tons. (See Table 79.)

In considering exports the trade of the United States with Canada must be distinguished from that with other countries. Except for the small shipments to Mexico, the coal trade with other countries is sea borne. The chief characteristic of this sea-borne trade during recent years is its uncertainty, for it is relatively new, fluctuating, and at times speculative. The trade with Canada, on the other hand, is stable and of long standing

Trade with Canada.—Exports of bituminous coal to Canada in 1927 were 14,594,000 net tons, or about a million tons more than in either 1925 or 1926. This increase of the export movement into Canada reflected increased demand due to the growth of Canada's coal consumption during 1927 by nearly 2,000,000 tons.[32]

Shipments of anthracite from the United States into Canada in 1927 were 3,239,000 net tons, a decline of 703,000 tons from 1926 and 15.6 per cent below the average for the five years from 1923 to 1927. It is worthy to note that while Pennsylvania anthracite lost a part of the Dominion's domestic fuel market imports of British anthracite into Canada increased from 272,170 net tons in 1926 to 882,251 tons in 1927.[33]

Sea-borne export trade.—From 21,510,000 net tons in 1926, when the overseas trade was greatly stimulated by the world-wide demand for coal caused by the British strike, sea-borne exports of bituminous coal fell to 3,288,000 tons in 1927. (See Table 3.) With the exception of 1922, when production was greatly restricted by a strike, this is the smallest sea-borne movement since 1911. In comparison with 1926 there were decreases of 15,013,000 net tons in shipments to Europe, 1,989,000 tons to South America, and 1,018,000 tons in shipments to Africa. (See Table 79.) Exports of American coals to such countries as France, Italy, and Brazil were considerably smaller than normal. In addition, the quantity of bunker coal loaded into vessels engaged in foreign trade in 1927 was 3,170,000 net tons less than in 1926 and 300,000 less than in 1925.

Sea-borne exports of anthracite were 78,000 net tons and showed only a slight variation from 1925 and 1926.

A comparison of the trends in monthly export shipments in 1927 and 1926, for anthracite and for bituminous coal, is made in Table 83.

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[32] Cook, S. J., Canada's Industrial Growth Reflected in Expansion of Coal Industry: Coal Age, vol. 33, No. 1, January, 1928, p. 67.

[33] Ibid.

TABLE 79.—*Bituminous coal exported, by countries, 1923–1927, in net tons* [1]

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country	1923	1924	1925	1926	1927
North America:					
Bermuda	16,936	20,206	13,470	23,122	18,031
British Honduras	1,633	429	391	562	419
Canada	16,854,257	12,654,869	13,421,007	13,633,513	14,594,297
Central America—					
Costa Rica	3,343	3,836	2	5,657	5,788
Guatemala	134	668	3,401	430	716
Honduras	1,719	2,154	2,018	1,302	988
Nicaragua	3,974	5,990	2,567	5,126	602
Panama	21,577	264,123	349,312	445,305	398,930
Salvador	3	72	69	128	157
Mexico	106,006	91,507	125,804	128,633	129,248
Miquelon and St. Pierre Islands	9,473	3,730	12,443	14,885	16,016
Newfoundland and Labrador	37,612	100,869	109,659	83,545	68,301
West Indies—					
British—					
Barbados	29,974	39,141	37,583	39,334	19,370
Jamaica	35,035	46,042	56,073	159,533	55,746
Trinidad and Tobago	23,885	28,326	26,180	59,353	60,022
Other British	24,879	19,031	36,745	50,079	28,581
Cuba	683,893	598,921	694,125	615,721	636,617
Dominican Republic	4,655	3,716	8,028	13,588	9,891
French	87,367	147,338	139,385	127,047	153,766
Haiti	2,988	234	67	8,143	838
Netherland	60,282	60,453	86,090	81,189	55,570
Virgin Islands of the United States	35,093	61,984	70,743	95,118	113,614
	18,044,718	14,153,639	15,195,162	15,591,313	16,367,508
South America:					
Argentina	146,793	220,058	164,712	1,115,526	236,018
Bolivia	584	----------	----------	14,112	----------
Brazil	348,011	850,234	657,888	1,333,640	419,709
Chile	21,984	61,940	27,280	3,405	3,938
Colombia	4,542	1,556	1,581	18,669	288
Ecuador	2,238	3,423	1,157	9,088	293
Falkland Islands	----------	----------	----------	11,862	5,716
Guiana—					
British	12,282	18,314	17,352	21,703	11,667
French	----------	----------	258	----------	----------
Surinam (Netherland)	2,659	2,913	2,726	5,645	12,629
Paraguay	----------	299	----------	----------	----------
Peru	11,222	21,410	21,462	29,683	16,912
Uruguay	32,810	68,803	22,194	145,601	33,179
Venezuela	2,190	2,598	811	20,592	551
	585,315	1,251,548	917,421	2,729,526	740,900
Europe:					
Azores and Madeira Islands	----------	----------	----------	23,057	----------
Belgium	91,280	17,164	----------	----------	----------
Denmark	----------	----------	----------	68,346	250
France	943,789	471,401	261,751	544,145	119,642
Germany	375,772	29,488	6,896	1,273	130
Gibraltar	----------	----------	----------	192,245	14,324
Greece	42,740	16,979	----------	28,925	----------
Iceland and Faroe Islands	----------	----------	----------	4,716	----------
Irish Free State	----------	----------	----------	769,849	19,757
Italy	655,295	975,146	871,454	1,727,057	359,654
Latvia	13,259	----------	----------	8,716	----------
Malta, Gozo, etc	----------	----------	----------	30,903	----------
Netherlands	424,397	----------	----------	31,674	----------
Norway	2,844	----------	2,402	92,133	473
Poland and Danzig	----------	----------	----------	4,514	----------
Portugal	----------	----------	----------	163,372	36,052
Spain	40,989	3,799	----------	18,751	----------
Sweden	57,817	----------	----------	5,027	----------
Turkey in Europe	----------	----------	----------	40,754	----------
United Kingdom—					
England	9,850	5,803			
Scotland	20,116	----------	18,124	12,048,062	237,198
Ireland	----------	----------			
Yugoslavia and Albania	----------	----------	----------	1,724	5,039
	2,678,148	1,519,780	1,160,627	15,805,243	792,519

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[1] Amounts stated do not include fuel or bunker coal loaded on vessels engaged in the foreign trade, which aggregated, in 1923, 5,093,024 tons; in 1924, 4,460,412 tons; in 1925, 4,865,521 tons; in 1926, 7,735,606 tons; and in 1927, 4,565,278 tons.

TABLE 79.—*Bituminous coal exported, by countries, 1923–1927, in net tons*—Con.

Country	1923	1924	1925	1926	1927
Asia:					
Aden					3,380
Arabia					3,382
British Malaya					3,525
China		4,355	3,006		
East Indies—					
British India		1,138	4,492		
Netherland		1,912		3,418	
Japan		1,978		194	
Java and Madura		1,557			
Palestine and Syria				15,811	
Philippine Islands		6,440		10,470	12,136
Soviet Russia in Asia		1	11		11
Turkey in Asia	2,821				
	2,821	17,381	7,509	29,893	22,434
Africa:					
Algeria and Tunisia	76,925	38,859	35,607	152,731	7,339
British—West	1,144	6,260	23,064	20,854	9,588
Canary Islands	2,452			290,303	
Egypt	25,756	46,245	40,018	359,434	71,431
French	15,710	54,905	78,677	122,185	
Liberia				11	
Morocco				19,706	
Portuguese—					
Mozambique				3,920	
Other Portuguese				137,392	
	121,987	146,269	177,366	1,106,536	88,358
Oceania:					
British—					
Australia	18,533		3,474	8,298	
New Zealand	1,587	4,349		1,128	
Other British		7,381			
French			1		25
Other Oceania	470				
	20,590	11,730	3,475	9,426	25
Grand total	21,453,579	17,100,347	17,461,560	35,271,937	18,011,744

TABLE 80.—*Bituminous coal exported, by districts and ports, 1923–1927, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Customs district	Principal ocean port or rail gateway	1923	1924	1925	1926	1927
North Atlantic:						
Massachusetts	Boston	339	148	692	3	20
Rhode Island						3
New York	New York	16,675	33,534	15,711	108,993	11,265
Philadelphia	Philadelphia	339,524	164,680	194,706	2,224,058	340,011
Maryland	Baltimore	1,589,667	653,679	336,855	6,465,788	392,366
Virginia	Hampton Roads	2,610,243	3,632,232	4,260,319	12,205,095	2,587,847
South Atlantic:						
South Carolina	Charleston	262,462	135,708	185,833	580,708	230,609
Georgia	Savannah			196		
Florida	Pensacola	36,020	4,004	11,629	57,761	1,852
Mobile	Mobile	10,312	49,495	45,969	35,991	26,905
New Orleans	New Orleans	7,950	6,524	5,547	54,678	3,796
Galveston		3			876	488
Sabine		34		853	39	
Mexican border:						
Arizona		40,769	41,228	62,821	67,290	77,351
El Paso		39,585	34,129	33,950	46,050	36,478
San Antonio		2,747	3,004	2,029	2,326	2,820
Pacific coast:						
Washington [1]		14,852	46,237	58,223	35,723	21,164
Oregon			602			
San Francisco		2,636	157	797	645	245
Los Angeles		90	200	96	54	317
San Diego		32				
Lake Erie ports: Ohio [2]	Lower Lake docks	6,991,116	5,766,459	5,244,332	5,730,535	6,223,502
Rail gateways on Canadian border:						
Eastern—						
Maine and New Hampshire.		11,528	4,941	41,580	50,173	40,389
Vermont		15,922	4,161	3,545	6,208	6,035
St. Lawrence		2,781,926	1,430,042	1,548,817	1,502,247	1,776,907
Rochester [3]		734,010	637,272	572,423	798,741	781,850
Buffalo		3,867,829	2,988,357	2,569,142	2,819,487	2,950,844
Michigan		1,926,314	1,284,609	2,088,046	2,290,484	2,303,082
Western—						
Duluth, Superior, and International Falls.		62,419	71,250	70,794	97,815	107,078
Dakota		87,984	100,900	106,503	89,942	88,013
Montana-Idaho		34	226		1	6
Miscellaneous:						
Alaska		293	63	16	11	235
Porto Rico		264	6,506	136	215	266
		21,453,579	17,100,347	17,461,560	35,271,937	18,011,744

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[1] Both rail to Canada and by tide to foreign ports.

[2] Lower Lake docks as follows: Toledo, Sandusky, Huron, Lorain, Cleveland, Fairport, Ashtabula, Conneaut, and Erie.

[3] Rail, car ferry, and Lake Ontario.

TABLE 81.—*Anthracite exported, by countries, 1923–1927, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country	1923	1924	1925	1926	1927
North America:					
Bermuda	2, 208	2, 053	1, 639	896	1, 644
British Honduras	858	42	353	468	
Canada	4, 988, 837	3, 927, 999	3, 096, 815	3, 941, 718	3, 238, 564
Central America—					
Costa Rica	2	12		28	
Guatemala	137	3	106	141	942
Honduras	3		45	96	84
Nicaragua	1	4	115	1	
Panama		392	920	463	684
Salvador	15	2		16	20
Mexico	4, 232	3, 665	809	5, 233	8, 605
Miquelon and St. Pierre Islands	303	200		389	652
Newfoundland and Labrador	5, 946	11, 623	10, 781	21, 690	17, 678
West Indies—					
British—					
Barbados	112	316		116	56
Jamaica			36	29	
Trinidad and Tobago				336	
Other British	162	174	204	304	148
Cuba	71, 280	63, 156	64, 994	55, 029	50, 202
Dominican Republic	10, 425	5, 341	2, 091	702	18
Haiti	141	45		1	
Netherland		1		75	150
Virgin Islands of the United States					33
	5, 084, 662	4, 015, 028	3, 178, 908	4, 027, 731	3, 319, 480
South America:					
Argentina	84			123	179
Bolivia				189	
Brazil		6			
Chile	505	6	3		
Colombia	17	38	88	78	802
Ecuador	55	1			
Guiana—British		3		569	
Peru		560	4		
Uruguay				225	94
Venezuela	21	24	3	37	39
	682	638	98	1, 221	1, 114
Europe:					
Azores and Madeira Islands				10	
France	4, 787	670			518
Greece	3			11	
Italy				112	
Portugal				152	
United Kingdom	4	1, 448		401	4, 393
	4, 794	2, 118		686	4, 911
Asia: Japan				45	
Africa: Liberia					2
Oceania: British		1			
Grand total	5, 090, 138	4, 017, 785	3, 179, 006	4, 029, 683	3, 325, 507

TABLE 82.—*Anthracite exported, by districts and ports, 1923–1927, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Customs district	Principal ocean port or rail gateway	1923	1924	1925	1926	1927
North Atlantic:						
Massachusetts	Boston	405	467	477	441	619
Rhode Island						5
Connecticut		48	45			
New York	New York	96,597	110,482	80,117	115,526	100,422
Philadelphia	Philadelphia	59,311	73,148	73,940	80,897	57,430
Maryland	Baltimore	11,091			41	
Virginia	Hampton Roads	7,791			84	5,863
		175,243	184,142	154,534	196,989	164,339
South Atlantic:						
Georgia	Savannah			44		221
South Carolina	Charleston	3,454				
Florida	Pensacola	165	3	2	101	8
Mobile	Mobile		45		96	
New Orleans	New Orleans	10	17	165	143	84
Sabine			35			
		3,629	100	211	340	313
Mexican border:						
Arizona		421	1,368	29	2,379	513
El Paso		1,929	1,626	637	1,458	7,115
San Antonio		1,607	577	73	1,197	862
		3,957	3,571	739	5,034	8,490
Pacific coast:						
Washington		2,585	3,178	30	231	748
San Francisco		39	21		16	20
Los Angeles		174	63	36	103	82
San Diego		1				
		2,799	3,262	66	350	850
Lake Erie ports: Ohio [1]	Lower Lake docks	39,731	16,908	17,664	20,558	409
Rail gateways on Canadian border:						
Eastern—						
Maine and New Hampshire		408	159	340	675	157
Vermont		14,123	4,509	3,086	3,633	7,748
St. Lawrence		1,647,117	1,252,786	985,145	1,505,343	1,266,400
Rochester [2]		512,434	287,609	205,556	222,584	164,213
Buffalo		2,619,713	2,220,310	1,769,625	2,041,218	1,691,599
Michigan		7,893	7,618	8,961	14,792	5,841
		4,801,688	3,772,991	2,972,713	3,788,245	3,135,958
Western—						
Duluth, Superior, and International Falls.		22,681	9,803	12,225	5,615	5,984
Dakota		40,369	27,007	20,854	12,552	9,130
Montana-Idaho						2
		63,050	36,810	33,079	18,167	15,116
Miscellaneous:						
Alaska		6				
Porto Rico		35	1			32
		41	1			32
Grand total		5,090,138	4,017,785	3,179,006	4,029,683	3,325,507

[1] Chiefly Buffalo and Erie.

[2] Rail, car ferry, and Lake Ontario.

TABLE 83.—*Anthracite and bituminous coal exported to Canada and to all other countries, by months, 1926 and 1927, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

	January	February	March	April	May	June	July	August	September	October	November	December	Year
1926													
Anthracite:													
Canada	6,904	41,508	321,833	324,441	359,727	425,944	428,525	431,318	396,909	504,011	378,530	322,068	3,941,718
Overseas and all other	164	104	11,158	5,737	6,599	5,861	7,512	10,833	9,376	10,291	13,169	7,161	87,965
	7,068	41,612	332,991	330,178	366,326	431,805	436,037	442,151	406,285	514,302	391,699	329,229	4,029,683
Bituminous (not including bunker coal):													
Canada	811,990	767,856	829,032	769,213	1,112,747	1,230,169	1,220,859	1,282,596	1,342,470	1,401,951	1,427,226	1,437,404	13,633,513
Overseas and all other	300,602	366,884	451,199	456,344	586,019	1,166,260	2,408,427	2,691,266	2,813,815	3,289,018	3,730,563	3,378,027	21,638,424
	1,112,592	1,134,740	1,280,231	1,225,557	1,698,766	2,396,429	3,629,286	3,973,862	4,156,285	4,690,969	5,157,789	4,815,431	35,271,937
Fuel or bunker coal loaded on vessels engaged in foreign trade	369,499	341,539	473,274	448,715	489,746	583,925	717,543	795,992	827,219	941,000	942,745	804,409	7,735,606
1927													
Anthracite:													
Canada	234,407	198,010	163,309	211,754	335,876	338,268	249,376	302,105	314,664	340,855	302,712	247,228	3,238,564
Overseas and all other	9,924	7,499	7,792	11,339	4,624	2,157	6,131	6,944	10,189	6,414	7,566	6,364	86,943
	244,331	205,509	171,101	223,093	340,500	340,425	255,507	309,049	324,853	347,269	310,278	253,592	3,325,507
Bituminous (not including bunker coal):													
Canada	1,070,685	1,129,005	1,188,144	1,132,143	1,369,479	1,706,099	1,531,116	1,244,745	1,301,614	1,163,168	1,063,235	694,864	14,594,297
Overseas and all other	857,825	386,846	356,627	251,050	163,924	191,230	183,233	190,652	169,554	237,092	191,981	237,433	3,417,447
	1,928,510	1,515,851	1,544,771	1,383,193	1,533,403	1,897,329	1,714,349	1,435,397	1,471,168	1,400,260	1,255,216	932,297	18,011,744
Fuel or bunker coal loaded on vessels engaged in foreign trade	421,570	340,649	360,695	386,173	371,660	399,796	374,983	392,914	413,022	392,986	406,863	303,967	4,565,278

Shipments to Alaska, Hawaii, and Porto Rico.—In addition to the export trade proper the United States supplies by sea a small tonnage to the Territories of Alaska, Hawaii, and Porto Rico. As shown in Table 84 the movement to Alaska is relatively steady, but that to Hawaii and Porto Rico tends to fluctuate within wide limits. In 1927, 39,000 tons was shipped coastwise to Alaska, 8,000 tons to Hawaii, and 54,000 tons to Porto Rico.

TABLE 84.—*Shipments of coal to Alaska, Hawaii, and Porto Rico, 1918–1927, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Year	Alaska (all coal)	Hawaii (all coal)	Porto Rico (all coal)
1918	51,520	73,006	116,161
1919	57,166	42,495	83,492
1920	38,128	17,634	104,021
1921	24,278	9,249	55,800
1922	28,457	846	55,356
1923	34,082	25,344	49,302
1924	40.161	49,074	58,434
1925	37,324	4,906	72,224
1926	35,620	10,885	120,457
1927	39,443	7,870	54,311

WORLD PRODUCTION OF COAL

The world production of coal of all grades in 1927 was 1,470,000,000 metric tons. Of this, approximately 199,000,000 tons was lignite, and 1,271,000,000 tons was bituminous coal and anthracite. The lignite production was much the largest on record and represented an increase of 54 per cent over 1913. The production of bituminous coal and anthracite also set a new record, but the increase over 1913 was small, amounting to only about 5 per cent. World demand in 1927 was stimulated by purchases to rebuild stocks after the 7-month strike of the British miners in 1926.

The trend of world demand for coal, as affected by fuel economy and the competition of oil and water power, was discussed in Coal in 1926, pages 528 to 531.

Table 86 gives the production of coal by countries from 1923 to 1927. It is based upon official reports, supplemented where necessary by trade information. Similar data by countries for 1888 to 1912 will be found in Coal in 1925, pages 491 to 494, for 1913 to 1919 in Coal in 1922, pages 575 to 577, and for 1920 to 1922 in Coal in 1923, page 646.

TABLE 85.—*World production of coal and lignite, 1888–1927*

[All countries known to have produced coal are included. Estimates are included for China in the years 1888 to 1905 and for certain of the very small producing countries in the years for which no data were obtainable, but in no year does the tonnage estimated exceed 1.1 per cent of the total]

Year	Million metric tons			Heat value		Year	Million metric tons			Heat value	
	Coal	Lignite	Total	Trillion B. t. u.	Index numbers 1913=100		Coal	Lignite	Total	Trillion B. t. u.	Index numbers 1913=100
1888	442	33	475	13, 226	36. 0	1908	964	105	1, 069	29, 236	79. 6
1889	450	36	486	13. 513	36. 8	1909	1, 009	106	1, 115	30. 540	83. 2
1890	478	38	516	14, 343	39. 1	1910	1, 059	107	1, 166	32, 001	87. 1
1891	498	40	538	14, 942	40. 7	1911	1, 074	111	1, 185	32, 471	88. 4
1892	503	41	544	15, 098	41. 1	1912	1, 128	120	1, 248	34, 141	93. 0
1893	491	43	534	14, 795	40. 3	1913	1, 213	129	1, 342	36, 724	100. 0
1894	514	45	559	15, 498	42. 2	1914	1, 086	121	1, 207	32, 941	89. 7
1895	542	48	590	16, 331	44. 5	1915	1, 069	124	1, 193	32, 476	88. 4
1896	557	51	608	16, 806	45. 8	1916	1, 159	132	1, 291	35, 164	95. 8
1897	584	55	639	17, 636	48. 0	1917	1, 223	133	1, 356	37, 015	100. 8
1898	614	59	673	18, 565	50. 6	1918	1, 198	135	1, 333	36, 301	98. 8
1899	673	62	735	20, 297	55. 3	1919	1, 044	129	1, 173	31, 799	86. 6
1900	708	69	777	21, 386	58. 2	1920	1, 166	153	1, 319	35, 637	97. 0
1901	725	75	800	21, 967	59. 8	1921	970	164	1, 134	30, 104	82. 0
1902	741	73	814	22, 395	61. 0	1922	1, 047	181	1, 228	32, 536	88. 6
1903	813	76	889	24, 509	66. 7	1923	1, 198	161	1, 359	36, 647	99. 8
1904	820	79	899	24, 746	67. 4	1924	1, 186	171	1, 357	36, 445	99. 2
1905	865	84	949	26, 102	71. 1	1925	1, 187	185	1, 372	36, 624	99. 7
1906	924	90	1, 014	27, 884	75. 9	1926	1, 180	185	1, 365	36, 428	99. 2
1907	1, 019	99	1, 118	30, 748	83. 7	1927	1, 271	199	1, 470	39, 227	106. 8

TABLE 86.—*Coal and lignite produced in the principal countries of the world in the calendar years 1923–1927, in metric tons*

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
North America:					
Canada—					
Coal	12, 163, 901	9, 138, 841	8, 627, 519	11, 687, 032	12, 341, 000
Lignite	3, 249, 605	3, 233, 459	3, 288, 262	3, 261, 599	3, 468, 000
Greenland	2, 117	2, 500	2, 100	1, 500	2, 900
Mexico	1, 261, 541	1, 226, 696	1, 444, 498	1, 309, 138	1, 031, 305
United States—					
Anthracite	84, 675, 282	79, 765, 491	56, 079, 281	76, 599, 968	72, 661, 094
Bituminous and lignite	512, 161, 770	438, 790, 754	471, 781, 446	520, 147, 061	469, 704, 558
South America:					
Argentina	(1)	(1)	(1)	(1)	(1)
Brazil	324, 154	342, 200	392, 376	[2] 400, 000	[2] 400, 000
Chile	1, 164, 028	1, 539, 141	1, 453, 228	1, 490, 509	1, 500, 000
Colombia	(1)	(1)	(1)	(1)	(1)
Peru	[3] 253, 000	151. 735	101, 081	165, 979	[3] 162, 370
Venezuela [4]	18, 050	16, 695	16, 798	15, 928	16, 104
Europe:					
Albania—Lignite	(1)	(1)	(1)	1, 578	(1)
Austria—					
Coal	157, 650	171, 959	145, 200	157, 308	175, 601
Lignite	2, 685, 467	2, 785, 816	3, 033, 378	2, 957, 728	3, 064, 068
Belgium	22, 922, 340	23, 361, 910	23, 097, 040	25, 259, 600	27, 573, 550
Bulgaria—					
Coal	61, 600	69, 670	73. 000	62, 150	69, 192
Lignite	1, 012, 594	1, 155, 291	1, 156, 006	1, 140, 093	1, 168, 454
Czechoslovakia—					
Coal	12, 347, 251	15, 178, 942	12. 558, 992	14, 176, 998	14, 016, 300
Lignite	16, 265, 530	20, 459, 690	18, 604, 678	18, 515, 666	19, 620, 637
France—					
Coal	37, 679, 314	44, 011, 240	47, 047, 630	51, 421, 772	51, 779. 000
Lignite	877, 123	944, 080	1, 007, 270	1, 056, 200	1, 068, 000
Germany [5]—					
Coal	62, 316, 134	118, 768, 748	132, 622, 125	145, 295, 724	153, 599, 354
Lignite	118, 784, 997	124, 637, 201	139, 724, 614	139, 150, 557	150, 503, 914
Saar [6]	9, 192, 275	14, 032, 120	12, 989, 850	13, 680, 874	13, 595, 824
Greece—Lignite	117, 927	131, 109	142, 076	150, 321	131, 109
Hungary—					
Coal	793, 075	744, 394	805, 019	826, 906	784, 154
Lignite	6, 894, 958	6, 333, 286	5, 520, 760	5, 822, 299	6, 243, 385

[1] Estimate included in total.
[2] Approximate production.
[3] Includes a small quantity of asphaltite.
[4] Exclusive of output of State of Falcón (about 8,000 tons), for which estimate is included in total.
[5] Exclusive of mines in the Saar under French control.
[6] Mines under French control.

TABLE 86.—*Coal and lignite produced in the principal countries of the world in the calendar years 1923–1927, in metric tons*—Continued

Country	1923	1924	1925	1926	1927
Europe—Continued.					
Irish Free State	(1)	(1)	(1)	(1)	(1)
Italy—					
Coal	173,700	126,985	188,522	209,260	164,089
Lignite	953,460	917,491	1,105,474	1,181,342	912,458
Netherlands—					
Coal	5,595,478	6,180,182	7,116,970	8,842,687	9,488,412
Lignite	54,185	191,202	207,623	211,194	201,382
Poland—					
Coal	36,097,997	32,224,680	29,081,327	35,747,348	38,084,086
Lignite	171,035	88,038	65,675	76,026	78,464
Portugal—					
Coal	137,613	124,801	123,450	201,732	178,554
Lignite	15,952	8,121	16,970	30,699	25,713
Rumania—					
Coal	291,983	297,288	313,572	322,191	373,457
Lignite	2,229,410	2,479,083	2,615,278	2,731,362	2,850,011
Russia [7]—					
Coal	8,736,755	12,849,307	13,354,011	20,614,717	27,448,262
Lignite	1,329,825	1,059,754	983,020	1,605,327	
Spain—					
Coal	5,971,446	6,127,586	6,117,342	6,536,087	6,562,936
Lignite	394,268	411,773	402,690	399,830	429,602
Spitzbergen	340,942	451,914	413,412	291,211	313,000
Sweden	419,569	437,856	263,879	383,673	398,298
Switzerland	(1)	(1)	(1)	(1)	7,000
Turkey—Lignite	(1)	(1)	2,000	4,638	4,000
United Kingdom—					
Great Britain	280,430,369	271,405,414	247,079,210	128,305,291	255,264,615
Northern Ireland—Lignite	(1)	(1)	(1)	(1)	510
Yugoslavia—					
Coal	136,267	131,633	178,456	190,814	287,728
Lignite	3,864,998	4,053,607	3,973,870	3,976,938	4,458,481
Asia:					
British Borneo	(1)	120,613	101,904	92,583	80,466
China	19,955,000	20,969,000	24,255,000	(1)	(1)
Chosen	279,978	399,415	634,257	682,896	735,000
Federated Malay States	322,994	378,778	414,634	471,736	470,432
India, British	19,972,376	21,514,131	21,239,892	21,336,204	22,436,757
Indo-China—					
Coal	1,051,497	1,231,315	1,357,231	1,284,661	1,482,900
Lignite	5,424	4,565	5,739	5,598	7,000
Japan (including Taiwan and Karafuto)—					
Coal	30,584,316	31,816,662	33,363,381	33,496,879	33,400,000
Lignite	151,462	176,764	169,426	161,134	(1)
Netherland East Indies	1,156,625	1,446,757	1,400,725	1,466,359	1,620,205
Philippine Islands	43,446	47,938	48,681	28,577	23,410
Russia [7] [8]—					
Coal	1,837,632	1,796,649	1,629,555	2,875,741	4,502,963
Lignite	761,423	604,783	533,880	687,648	
Sakhalin	105,384	97,078	(1)	(1)	(1)
Straits Settlements (Labuan)	------------	10	41	------------	------------
Turkey—					
Coal	(1)	769,000	745,000	828,213	812,900
Lignite	(1)	(1)	2,368	(1)	5,947
Africa:					
Algeria	3,562	9,228	10,037	13,731	21,269
Belgian Congo	65,000	81,000	83,000	90,250	85,500
Nigeria	193,644	235,848	242,833	[9] 358,944	359,512
Portuguese East Africa	------------	------------	18,086	10,868	15,834
Rhodesia, Southern	559,999	591,526	689,201	874,140	908,744
Tunisia—Lignite	620	305	------------	------------	------------
Union of South Africa	11,252,305	11,819,988	12,321,728	12,949,950	12,580,314
Oceania:					
Australia—					
New South Wales	10,646,693	11,804,688	11,579,108	11,060,483	11,304,688
Queensland	1,077,686	1,141,143	1,196,067	1,240,657	1,116,680
Tasmania	82,014	77,208	83,009	104,000	113,854
Victoria—					
Coal	484,476	526,634	542,821	600,487	695,227
Lignite	118,764	129,536	890,535	973,310	1,478,842
Western Australia	427,466	428,635	444,482	482,440	509,554
New Zealand—					
Coal	950,715	1,102,418	1,044,726	1,215,590	1,299,044
Lignite	1,050,735	1,014,224	1,070,269	1,060,361	1,104,142
Total, all grades	1,359,000,000	1,357,000,000	1,372,000,000	1,365,000,000	1,470,000,000
Lignite (total of items shown above)	161,000,000	171,000,000	185,000,000	185,000,000	199,000,000
Bituminous and anthracite (by subtraction)	1,198,000,000	1,186,000,000	1,187,000,000	1,180,000,000	1,271,000,000

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[1] Estimate included in total.
[7] Year ended Sept. 30.
[8] Exclusive of Sakhalin.
[9] Year ended Mar. 31 of year following that stated.

DETAILED STATISTICS OF BITUMINOUS COAL, BY STATES AND COUNTIES

TABLES OF PRODUCTION, VALUE, MEN EMPLOYED, DAYS WORKED, AND OUTPUT PER MAN IN 1927

The following table (No. 87) presents detailed statistics for each coal-producing county from which three or more operators reported production. Where less than three reports were received the figures for two or more counties have been combined to avoid disclosing individual returns, unless permission to publish has been granted by the producers.

The series gives the details of total value of product, average value per ton, men employed by broad occupational groups, average number of days worked by the mines, and output per man per day. The figures include stripping operations as well as deep mines. Separate particulars for the stripping operations in each county are given in Table 35. If the reader will deduct the stripping figures as given in that table from the totals for all mines in the following table, he will find that the remainder represents the operations of the deep mines. By this means figures can be obtained for the deep mines separately in any State or county desired.

TABLE 87.—*Production, value, men employed, days worked, and output per man per day at bituminous coal mines in specified States and counties in 1927*

[Note that figures relate only to active mines of commercial size; no canvass made of wagon mines producing less than 1,000 tons]

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Underground			Surface	Total		
								Miners, loaders, and shot firers	Haulage and track	All others				
ALABAMA														
Bibb	1,206,969	7,453	19,260		1,233,682	$3,256,000	$2.64	1,250	174	291	289	2,004	215	2.86
Blount	352,170	21,035	7,406		380,611	919,000	2.41	449	93	24	130	696	229	2.39
Etowah and St. Clair	762,596	6,883	41,095		810,574	1,796,000	2.22	569	102	127	141	939	225	3.84
Fayette and Marion	242,516	3,106	381		246,003	751,000	3.05	305	43	38	84	470	201	2.60
Jefferson	8,746,572	141,336	138,319		9,026,227	21,604,000	2.39	6,884	1,493	1,869	1,744	11,990	247	3.04
Shelby	683,673	23,400	1,644		708,717	2,461,000	3.47	950	141	126	278	1,495	228	2.08
Tuscaloosa	754,306	12,690	2,481		769,477	1,730,000	2.25	814	195	151	201	1,361	201	2.81
Walker	6,130,363	433,731	22,257		6,586,351	11,997,000	1.82	4,990	1,139	1,034	1,466	8,629	220	3.46
Winston	1,700	2,524			4,224	10,000	2.37	22	3	2	4	31	95	1.44
	18,880,865	652,158	232,843		19,765,866	44,524,000	2.25	16,233	3,383	3,662	4,337	27,615	231	3.10
ALASKA														
Total	98,042	5,215	1,043		104,300	$548,000	$5.25	56	10	27	61	154	229	2.96
ARIZONA														
Total		4,583			4,583	$6,000	$1.31	8				8	156	3.67

ARKANSAS

Franklin	273, 038	4, 904	4, 883		282, 825	$869, 000	$3. 07	166	28	17	187	398	162	4. 39
Johnson	284, 363	441	3, 014		287, 818	1, 307, 000	4. 54	623	157	111	210	1, 101	96	2. 72
Logan	177, 032	1, 159	1, 434		179, 625	925, 000	5. 15	465	54	59	72	650	125	2. 21
Sebastian	697, 347	4, 785	8, 173		710, 305	1, 832, 000	2. 58	836	157	140	155	1, 288	165	3. 34
Other counties (Pope and Scott)	83, 550	4, 411	300		88, 261	460, 000	5. 21	188	22	20	39	269	164	2. 00
	1, 515, 330	15, 700	17, 804		1, 548, 834	5, 393, 000.	3. 48	2, 278	418	347	663	3, 706	137	3. 05

CALIFORNIA, IDAHO, NEVADA, AND OREGON

Total	21, 076	4, 679	2, 086		27, 841	$85, 000	$3. 05	44	6	18	20	88	208	1. 52

COLORADO

Boulder	342, 148	78, 075	21, 768		441, 991	$1, 151, 000	$2. 60	386	68	91	84	629	140	5. 02
Delta	59, 100	28, 985	3, 708		91, 793	265, 000	2. 88	65	6	6	24	101	188	4. 85
Dolores, Ouray, and San Miguel		9, 222	340		9, 562	31, 000	3. 24	13	1	1	1	16	216	2. 77
El Paso	175, 474	167, 530	13, 506		356, 510	767, 000	2. 15	285	26	33	37	381	226	4. 14
Fremont	360, 038	82, 852	4, 595		447, 485	1, 706, 000	3. 81	657	132	138	181	1, 108	159	2. 54
Garfield	9, 982	20, 097	200		30, 279	80, 000	2. 64	27	2	2	5	36	210	4. 01
Gunnison	530, 546	5, 622	22, 948		559, 116	1, 559, 000	2. 79	357	93	81	120	651	168	5. 09
Huerfano	1, 775, 191	16, 672	24, 067		1, 815, 930	5, 664, 000	3. 12	1, 451	294	260	486	2, 491	205	3. 56
Jefferson	43, 709	5, 659	10, 964		60, 332	132, 000	2. 19	55	7	18	17	97	144	4. 33
La Plata	32, 552	38, 508		18, 763	89, 823	249, 000	2. 77	72	12	12	17	113	229	3. 46
Las Animas	2, 790, 781	44, 029	48, 428	300, 707	3, 183, 945	8, 511, 000	2. 67	2, 425	438	333	537	3, 733	236	3. 62
Mesa	82, 554	28, 869	2, 400		113, 823	307, 000	2. 70	114	10	13	13	150	217	3. 49
Moffat		3, 913			3, 913	11, 000	2. 81	4	1	1	1	7	195	2. 87
Montezuma	1, 020	3, 784			4, 804	23, 000	4. 79	8	2	3	3	16	131	2. 29
Rio Blanco		4, 598			4, 598	17, 000	3. 70	9	2	2	2	15	178	1. 72
Routt	864, 917	17, 550	43, 166		925, 633	3, 130, 000	3. 38	565	119	100	252	1, 036	[1] 117	[1] 7. 64
Weld	1, 411, 036	71, 596	26, 941		1, 509, 573	3, 268, 000	2. 16	878	129	178	141	1, 326	189	6. 03
Other counties (Elbert, Jackson, and Pitkin)	63, 917	7, 652	3, 396		74, 965	173, 000	2. 31	58	10	11	14	93	242	3. 34
	8, 542, 965	635, 213	226, 427	319, 470	9, 724, 075	27, 044, 000	2. 78	7, 429	1, 352	1, 283	1, 935	11, 999	196	4. 13

GEORGIA

Total	72, 083	552	799	3, 278	76, 712	$233, 000	$3. 04				114	114	250	2. 69

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[1] In this county certain mines have in recent times followed the practice of reducing their forces in periods of dull market and of working every day underground when the tipple works only 1, 2, or 3 days a week. As the figures of days worked represent tipple time, the result is not comparable with the returns for other counties, and the average for the State is affected also.

TABLE 87.—*Production, value, men employed, days worked, and output per man per day at bituminous coal mines in specified States and counties in 1927*—Continued

ILLINOIS

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Bond, Clinton, and Marion	1, 398, 213	80, 201	49, 789		1, 528, 203	$3, 002, 000	$1. 96	1, 333	206	276	210	2, 025	131	5. 77
Bureau	89, 683	22, 748	4, 621		117, 052	363, 000	3. 10	762	74	80	73	989	60	1. 97
Cass, Hancock, and Scott		3, 156			3, 156	15, 000	4. 75	12	2	2	3	19	114	1. 46
Christian	2, 540, 132	139, 806	25, 736		2, 705, 674	5, 968, 000	2. 21	3, 107	415	401	320	4, 243	115	5. 54
Edgar, Logan, and Macon	118, 125	173, 886	6, 160		298, 171	865, 000	2. 90	419	57	105	74	655	143	3. 18
Franklin	10, 138, 393	86, 495	90, 695		10, 315, 583	23, 622, 000	2. 29	10, 259	1, 664	1, 846	1, 330	15, 099	119	5. 74
Fulton	1, 379, 458	163, 616	4, 570		1, 547, 644	2, 893, 000	1. 87	1, 258	108	111	261	1, 738	137	6. 48
Gallatin	17, 500	15, 760	1, 750		35, 010	74, 000	2. 11	106	10	13	16	145	73	3. 32
Greene		5, 333			5, 333	16, 000	3. 00	7	1	1	1	10	120	4. 46
Grundy	236, 309	3, 555	1, 235		241, 099	585, 000	2. 43	240	62	50	36	388	135	4. 61
Henry	43, 844	40, 493	1, 947		86, 284	259, 000	3. 00	243	18	24	21	306	90	3. 13
Jackson	957, 731	42, 052	3, 682		1, 003, 465	1, 837, 000	1. 83	507	132	124	289	1, 052	93	10. 26
Jefferson and White	82, 952	6, 541	10, 664		100, 157	211, 000	2. 11	174	33	21	39	267	99	3. 77
Knox	84, 711	41, 230	909		126, 850	353, 000	2. 78	145	13	11	18	187	205	3. 32
La Salle	130, 888	301, 103	4, 040		436, 031	1, 212, 000	2. 78	819	83	103	100	1, 105	132	3. 00
Livingston		35, 181	480		35, 661	115, 000	3. 22	47	5	6	8	66	168	3. 22
McDonough		9, 837			9, 837	39, 000	3. 96	29	4	2	2	37	145	1. 83
McLean, Will, and Woodford	61, 484	45, 798	5, 911		113, 193	351, 000	3. 10	359	33	31	37	460	126	1. 96
Macoupin	3, 172, 563	63, 415	71, 144		3, 307, 122	6, 483, 000	1. 96	3, 361	578	623	284	4, 846	105	6. 49
Madison	2, 007, 393	213, 644	39, 845		2, 260, 882	5, 054, 000	2. 24	2, 636	377	528	290	3, 831	101	5. 86
Marshall		10, 884			10, 884	30, 000	2. 76	20	2	1	1	24	164	2. 77
Menard	13, 645	65, 378	3, 177		82, 200	212, 000	2. 58	113	12	6	15	146	178	3. 17
Mercer	36, 445	32, 301	750		69, 496	175, 000	2. 52	143	18	15	18	194	104	3. 44
Montgomery	994, 198	22, 331	17, 716		1, 034, 245	2, 018, 000	1. 95	1, 310	197	214	116	1, 837	98	5. 75
Peoria	718, 290	188, 845	5, 009		912, 144	2, 032, 000	2. 23	1, 187	169	110	110	1, 576	146	3. 97
Perry	1, 500, 394	94, 927	38, 810		1, 634, 131	3, 403, 000	2. 08	1, 656	261	113	391	2, 421	106	6. 37
Randolph	591, 113	45, 465	15, 472		652, 050	1, 342, 000	2. 06	868	159	133	99	1, 259	92	5. 60
Rock Island		30, 100	260		30, 360	121, 000	3. 99	49	2	5	6	62	160	3. 06
St. Clair	2, 676, 901	376, 234	61, 690		3, 114, 825	6, 087, 000	1. 95	3, 690	580	416	482	5, 168	107	5. 63
Saline	3, 038, 337	70, 345	57, 528		3, 166, 210	6, 242, 000	1. 97	4, 447	735	472	623	6, 277	106	4. 76
Sangamon	2, 982, 466	305, 126	38, 032		3, 325, 624	7, 305, 000	2. 20	5, 513	602	505	476	7, 096	113	4. 16
Schuyler		16, 447			16, 447	41, 000	2. 49	14	3	3	3	23	188	3. 79
Shelby	15, 075	20, 599	3, 754		39, 428	116, 000	2. 94	93	10	9	15	127	129	2. 40

Stark		8,293	25		8,318	24,000	2.88	26	3	3	3	35	136	1.75
Tazewell	306,075	128,231	904		435,210	1,026,000	2.36	451	52	74	57	634	171	4.02
Vermilion	2,354,989	313,245	63,597		2,731,831	6,370,000	2.33	1,867	292	551	427	3,137	161	5.42
Wabash		5,499			5,499	14,000	2.55	13	2	2	2	19	117	2.47
Warren		5,448	300		5,748	28,000	4.87	12	2	2	2	18	187	1.71
Washington	221,601	72,082	9,569		303,252	681,000	2.25	309	67	58	51	485	112	5.57
Williamson	4,848,759	74,071	71,085		4,993,915	10,772,000	2.16	6,194	850	953	967	8,964	97	5.74
	42,757,667	3,379,701	710,856		46,848,224	101,356,000	2.16	53,798	7,893	8,003	7,276	76,970	114	5.36
INDIANA														
Clay	696,144	53,767	33,501		783,412	$1,705,000	$2.18	337	59	41	297	734	173	6.16
Daviess	35,835	19,258	1,710		56,803	114,000	2.01	60	10	8	12	90	200	3.16
Fountain and Parke		4,086			4,086	13,000	3.18	7	1	1	1	10	154	2.65
Gibson	993,706	23,835	14,372		1,031,913	1,843,000	1.79	760	200	234	151	1,345	132	5.80
Greene	1,078,163	27,526	17,278		1,122,967	2,206,000	1.96	695	95	141	296	1,227	115	7.98
Knox	1,236,465	48,632	4,665		1,289,762	2,646,000	2.05	1,821	287	352	249	2,709	76	6.23
Owen	18,904	3,350	576		22,830	48,000	2.10	21	4	1	36	62	109	3.38
Perry, Spencer, and Vanderburg	231,204	163,541	7,355		402,100	750,000	1.87	270	66	39	41	416	204	4.75
Pike	2,656,378	27,848	35,367		2,719,593	5,525,000	2.03	556	107	156	841	1,660	189	8.68
Sullivan	3,438,528	72,040	77,920		3,588,488	7,510,000	2.09	2,785	646	566	708	4,705	130	5.86
Vermilion	1,859,968	32,434	30,089		1,922,491	3,862,000	2.01	2,197	482	146	343	3,168	98	6.21
Vigo	3,288,591	305,211	106,771		3,700,573	8,014,000	2.17	4,721	708	828	596	6,853	98	5.51
Warrick	1,220,256	55,394	15,090		1,290,740	2,145,000	1.66	695	143	81	454	1,373	185	5.09
	16,754,142	836,922	344,694		17,935,758	36,381,000	2.03	14,925	2,808	2,594	4,025	24,352	120	6.13
IOWA														
Adams		3,860			3,860	$14,000	$3.63	13	1	2	2	18	206	1.04
Appanoose	259,716	55,830	1,067		316,613	1,008,000	3.18	1,622	186	112	143	2,063	69	2.21
Boone	216,413	62,752	4,426		283,591	1,247,000	4.40	679	96	74	58	907	135	2.31
Dallas	259,618	15,368	1,649		276,635	841,000	3.04	469	71	54	49	643	127	3.38
Davis, Jefferson, and Keokuk		6,183			6,183	23,000	3.72	13	2	2	2	19	138	2.36
Greene, Story, and Webster		13,186			13,186	45,000	3.41	23	3	6	5	37	184	1.94
Guthrie		7,534			7,534	31,000	4.11	19	1	2	4	26	192	1.51
Jasper	4,600	42,301	2,010		48,911	140,000	2.86	75	9	10	15	109	142	3.16
Mahaska	725	42,900	492		44,117	112,000	2.54	113	4	8	10	135	138	2.37
Marion	431,062	35,387	8,779		475,228	1,294,000	2.72	690	107	126	78	1,001	122	3.88
Monroe	411,291	23,108	10,574		444,973	1,327,000	2.98	975	176	134	93	1,378	102	3.18
Polk	257,040	326,906	10,609		594,555	1,851,000	3.11	862	124	119	94	1,199	158	3.14
Taylor	10,650	6,662			17,312	75,000	4.33	46	2	3	4	55	198	1.59
Van Buren	7,458	3,445	120		11,023	25,000	2.27	18	1	1	2	22	214	2.34
Wapello	1,193	54,262	370		55,825	174,000	3.12	101	8	10	13	132	169	2.51
Warren	112,229	5,828	8,950		127,007	396,000	3.12	254	51	49	32	386	99	3.32
Wayne	800	19,985	225		21,010	72,000	3.43	62	7	5	8	82	131	1.96
Other counties (Lucas and Page)	173,993	21,258	6,808		202,059	629,000	3.11	319	45	121	44	529	112	3.41
	2,146,788	746,755	56,079		2,949,622	9,304,000	3.15	6,353	894	838	656	8,741	114	2.96

TABLE 87.—*Production, value, men employed, days worked, and output per man per day at bituminous coal mines in specified States and counties in 1927*—Continued

KANSAS

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Bourbon	4, 500	22, 285	300		27, 085	$66, 000	$2. 44	30	2	4	23	59	138	3. 33
Cherokee	837, 309	80, 252	13, 154		930, 715	2, 400, 000	2. 58	576	56	23	301	956	152	6. 42
Crawford	2, 044, 354	177, 127	29, 036		2, 250, 517	6, 243, 000	2. 77	3, 658	346	221	732	4, 957	122	3. 72
Franklin and Leavenworth	50, 020	54, 303	1, 136		105, 459	488, 000	4. 63	354	20	55	46	475	277	. 80
Linn	41, 999	9, 684	200		51, 883	117, 000	2. 26	93	10	6	9	118	166	2. 65
Neosho		4, 185			4, 185	12, 000	2. 77	16	2	2	2	22	153	1. 24
Osage	50, 111	23, 637	170		73, 918	322, 000	4. 36	327	37	25	28	417	126	1. 41
	3, 028, 293	371, 473	43, 996		3, 443, 762	9, 648, 000	2. 80	5, 054	473	336	1, 141	7, 004	138	3. 57

KENTUCKY

County	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total	Average number of days worked	Average tons per man per day
Eastern district:														
Bell	3, 194, 807	61, 745	14, 669		3, 271, 221	$5, 557, 000	$1. 70	2, 584	489	428	543	4, 044	216	3. 75
Boyd	24, 241	10, 403			34, 644	56, 000	1. 62	54	10	3	7	74	238	1. 97
Breathitt	99, 545	73, 032	4, 350		176, 927	287, 000	1. 62	182	47	31	42	302	218	2. 69
Carter	67, 805	48, 131	74		116, 010	193, 000	1. 66	139	24	24	31	218	173	3. 08
Clay	109, 108	1, 555	61		110, 724	206, 000	1. 86	155	15	14	29	213	155	3. 36
Floyd	5, 181, 323	43, 513	36, 383		5, 261, 219	9, 537, 000	1. 81	3, 307	704	662	803	5, 476	231	4. 15
Harlan	13, 373, 932	80, 956	55, 608	156, 947	13, 667, 443	25, 672, 000	1. 88	6, 733	1, 628	1, 076	1, 543	10, 980	263	4. 74
Johnson	1, 183, 055	15, 413	16, 819		1, 215, 287	2, 781, 000	2. 29	922	157	199	171	1, 449	239	3. 51
Knott	575, 273	3, 350			578, 623	922, 000	1. 59	278	44	36	62	420	229	6. 01
Knox	320, 108	12, 113	5, 028		337, 249	547, 000	1. 62	367	91	80	80	618	173	3. 15
Laurel	128, 994		60		129, 054	194, 000	1. 50	262	20	30	39	351	165	2. 23
Lee	29, 800	1, 185	300		31, 285	60, 000	1. 92	59	5	5	10	79	180	2. 20
Letcher	6, 316, 218	44, 715	60, 986		6, 421, 919	12, 221, 000	1. 90	3, 277	968	842	777	5, 864	256	4. 28
McCreary	978, 139	15, 112			993, 251	1, 930, 000	1. 94	708	157	158	128	1, 151	232	3. 72
Martin	564, 944	1, 895			566, 839	811, 000	1. 43	231	68	48	49	396	201	7. 11
Perry	6, 272, 508	94, 234	20		6, 366, 762	10, 989, 000	1. 73	3, 336	618	854	942	5, 750	229	4. 83
Pike	7, 631, 413	60, 897	57, 165		7, 749, 475	12, 939, 000	1. 67	3, 957	982	989	1, 293	7, 221	239	4. 48

Whitley	622, 202	10, 817	20, 673		653, 692	1, 393, 000	2. 13	816	77	104	142	1, 139	175	3. 29
Other counties (Lawrence, Magoffin, and Morgan)	228, 224	3, 987	5, 573		237, 784	390, 000	1. 64	167	23	22	73	285	236	3. 53
	46, 901, 639	583, 053	277, 769	156, 947	47, 919, 408	86, 685, 000	1. 81	27, 534	6, 127	5, 605	6, 764	46, 030	238	4. 37
Western district:														
Daviess	92, 784	73, 340	1, 525		167, 649	260, 000	1. 55	137	15	15	25	192	236	3. 70
Henderson	407, 227	44, 490	18, 756		470, 473	760, 000	1. 62	365	80	83	59	587	191	4. 21
Hopkins	7, 351, 563	56, 516	39, 638		7, 447, 717	11, 705, 000	1. 57	3, 152	699	527	1, 097	5, 475	252	5. 39
McLean	117, 835	1, 325	6, 225		125, 385	170, 000	1. 36	107	20	14	21	162	172	4. 49
Muhlenberg	6, 295, 850	71, 474	70, 637		6, 437, 961	9, 722, 000	1. 51	3, 747	684	913	633	5, 977	217	4. 96
Ohio	1, 443, 019	11, 148	26, 305		1, 480, 472	2, 132, 000	1. 44	1, 128	211	98	302	1, 739	208	4. 08
Union	1, 545, 906	34, 614	24, 948		1, 605, 468	2, 538, 000	1. 58	1, 026	155	348	184	1, 713	256	3. 66
Webster	3, 411, 207	22, 310	19, 238		3, 452, 755	5, 255, 000	1. 52	1, 831	274	397	326	2, 828	256	4. 77
Other counties (Crittenden and Hancock)	12, 966	1, 554	2, 190		16, 710	22, 000	1. 32	26	6	5	7	44	102	3. 73
	20, 678, 357	316, 771	209, 462		21, 204, 590	32, 564, 000	1. 54	11, 519	2, 144	2. 400	2, 654	18, 717	235	4. 83
Total, all Kentucky	67, 579, 996	899, 824	487, 231	156, 947	69, 123, 998	119, 249, 000	1. 73	39, 053	8, 271	8, 005	9, 418	64, 747	237	4. 50

MARYLAND

Allegany	1, 968, 580	94, 053	5, 011		2, 067, 644	$4, 511, 000	$2. 18	1, 717	297	271	325	2, 610	225	3. 52
Garrett	724, 975	13, 262	8, 961		747, 198	1, 306, 000	1. 75	537	122	65	125	849	203	4. 33
	2, 693, 555	107, 315	13, 972		2, 814, 842	5, 817, 000	2. 07	2, 254	419	336	450	3, 459	220	3. 70

MICHIGAN

Bay	129, 074	6, 471	5, 753		141, 298	$618, 000	$4. 37	279	43	41	31	394	158	2. 27
Midland and Saginaw	567, 746		47, 719		615, 465	2, 644, 000	4. 30	806	122	104	86	1, 118	198	2. 78
	696, 820	6, 471	53, 472		756, 763	3, 262, 000	4. 31	1, 085	165	145	117	1, 512	198	2. 67

TABLE 87.—*Production, value, men employed, days worked, and output per man per day at bituminous coal mines in specified States and counties in 1927*—Continued

MISSOURI

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Adair	152,585	24,384	4,904		181,873	$470,000	$2.58	287	42	44	34	407	198	2.25
Audrain		9,740	68		9,808	47,000	4.79	40	5	4	5	54	178	1.02
Barton	1,101,921	10,302	27,876		1,140,099	3,070,000	2.69	268	22	16	657	963	147	[2] 8.05
Bates	208,177	11,385	4,725		224,287	515,000	2.30	189	19	12	137	357	166	3.79
Boone		20,770	12		20,782	76,000	3.66	77	7	4	16	104	167	1.20
Caldwell and Platte	8,021	10,550	1,340		19,911	92,000	4.62	47	2	16	8	73	164	1.66
Callaway		31,908	28		31,936	118,000	3.69	81	9	9	24	123	192	1.35
Cedar and Vernon	122,214	2,648	540		125,402	292,000	2.33	19	3	3	82	107	202	5.81
Chariton and Howard	53,998	7,238			61,236	155,000	2.53	11	3	2	67	83	184	4.00
Clay	43,752	15,281	256		59,289	222,000	3.74	174	19	26	17	236	156	1.61
Grundy and Harrison	4,684	6,443	350		11,477	51,000	4.44	26	5	6	3	40	196	1.47
Henry	190,064	10,571	7,240		207,875	514,000	2.47	19	2	1	110	132	218	[2] 7.22
Johnson	53,989	4,500			58,489	165,000	2.82	32	10	12	41	95	275	2.24
Lafayette	148,717	48,732	3,592		201,041	680,000	3.38	702	50	121	62	935	113	1.91
Linn	8,325	20,411	600		29,336	99,000	3.37	105	13	9	14	141	150	1.39
Macon	60,479	36,312	1,331		98,122	287,000	2.92	266	22	36	25	349	121	2.33
Monroe		1,211			1,211	5,000	4.13	7	2	1	2	12	155	.65
Putnam	9,120	22,981	16		32,117	82,000	2.55	112	15	7	13	147	108	2.02
Ralls	12,682	1,070			13,752	49,000	3.56	44	4	6	5	59	149	1.57
Randolph	142,384	59,570	4,837		206,791	544,000	2.63	300	38	51	35	424	225	2.16
Ray	272,000	44,234	916		317,150	1,130,000	3.56	1,053	87	120	99	1,359	120	1.94
Schuyler	7,995	4,364			12,359	35,000	2.83	28	2	1	1	32	163	2.37
	2,601,107	404,605	58,631		3,064,343	8,698,000	2.84	3,887	381	507	1,457	6,232	151	3.26

MONTANA

Carbon	829, 375	24, 057	41, 707		895, 139	$2, 559, 000	$2. 86	502	105	70	141	818	213	5. 14
Cascade	140, 158	26, 019			166, 177	414, 000	2. 49	156	33	21	40	250	136	4. 88
Fergus		3, 152			3, 152	13, 000	4. 12	4	1	1	1	7	173	2. 60
Musselshell	1, 144, 310	13, 276	11, 499		1, 169, 085	2, 952, 000	2. 53	612	158	132	112	1, 014	196	5. 89
Roosevelt		4, 268			4, 268	11, 000	2. 58	6	1	1	1	9	166	2. 86
Rosebud	821, 194		920		822, 114	1, 233, 000	1. 50				60	60	235	[3] 58. 31
Sheridan		20, 229			20, 229	43, 000	2. 13	20	3	3	3	29	207	3. 36
Other counties (Blaine, Chouteau, Daniels, Dawson, Hill, Judith Basin, Pondera, Richland, Toole, and Wibaux)	28, 900	34, 174	400		63, 474	178, 000	2. 80	66	13	5	10	94	219	3. 08
	2, 963, 937	125, 175	54, 526		3, 143, 638	7, 403, 000	2. 35	1, 366	314	233	368	2, 281	197	6. 99

NEW MEXICO

Colfax	1, 813, 774	12, 279	24, 309		1, 850, 362	$5, 416, 000	$2. 93	1, 053	195	198	315	1, 761	264	3. 98
McKinley	748, 790	19, 648	22, 847		791, 285	2, 597, 000	3. 28	681	106	120	127	1, 034	214	3. 58
Rio Arriba	13, 770	2, 344	365		16, 479	47, 000	2. 85	20	8	4	6	38	223	1. 95
San Juan		5, 101			5, 101	13, 000	2. 55	5	1	2	1	9	229	2. 48
Other counties (Lincoln, Sandoval, Santa Fe, and Socorro)	246, 565	10, 452	15, 295		272, 312	1, 106, 000	4. 06	291	74	86	163	614	279	1. 59
	2, 822, 899	49, 824	62, 816		2, 935, 539	9, 179, 000	3. 13	2, 050	384	410	612	3, 456	251	3. 38

NORTH CAROLINA

Total	48, 535	4, 842			53, 377	$191, 000	$3. 58	80	21	14	25	140	284	1. 34

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[2] The output of this county is chiefly obtained from strip pits, in which the production per man per day is large.

[3] The output of this county is obtained from strip pits, in which the production per man per day is large.

TABLE 87.—*Production, value, men employed, days worked, and output per man per day at bituminous coal mines in specified States and counties in 1927*—Continued

NORTH DAKOTA (LIGNITE)

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Adams	41, 284	15, 096	1, 334		57. 714	$107, 000	$1. 85	42	5	2	9	58	201	4. 95
Billings, Golden Valley, and McKenzie	385	3, 872			4. 257	8, 000	1. 88	10		1	5	16	84	3. 17
Bowman	37, 396	11, 670	6, 650		55, 716	76, 000	1. 36	22	1	2	10	35	264	6. 04
Burke	283, 772	4, 802	4, 050		292, 624	507, 000	1. 73				83	83	178	[3] 19. 74
Burleigh	213, 713	16, 251	4, 296		234, 260	375, 000	1. 60	113	15	13	36	177	190	6. 97
Divide	10, 435	5, 781			16, 216	40, 000	2. 47	27	3	2	7	39	168	2. 48
Dunn		6, 379			6, 379	14, 000	2. 19	5	2	2	3	12	146	3. 63
Grant	612	11, 497			12, 109	24, 000	1. 98	13	2	2	11	28	133	3. 26
Hettinger	13, 192	14, 088			27, 280	47, 000	1. 72	22	3	3	27	55	161	3. 09
McLean	76, 939	25, 114	1, 734		103, 787	216, 000	2. 08	74	5	4	77	160	116	5. 60
Mercer	386, 459	14, 625	4, 271		405, 355	589, 000	1. 45	170	19	5	64	258	157	10. 01
Morton	14, 858	25, 472	1, 000		41, 330	72, 000	1. 74	29	4	5	18	56	218	3. 38
Mountrail		6, 365			6, 365	19, 000	2. 99	8	2	2	2	14	223	2. 04
Oliver		3, 435			3, 435	5, 000	1. 46				4	4	234	3. 67
Stark	26, 450	23, 251	986		50, 687	97, 000	1. 91	54	4	3	11	72	252	2. 80
Ward	91, 368	51, 156	40		142, 564	269, 000	1. 89	77	4	5	91	177	122	6. 61
Williams	16, 308	51, 169	384		67, 861	139, 000	2. 05	78	6	5	8	97	195	3. 58
	1, 213, 171	290, 023	24, 745		1, 527, 939	2, 604, 000	1. 70	744	75	56	466	1, 341	168	6. 78

OHIO

County	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Value: Total	Value: Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total	Average number of days worked	Average tons per man per day
Athens	1, 060, 194	41, 793	11, 091		1, 113, 078	$2, 109, 000	$1. 89	3, 477	367	428	473	4, 745	59	3. 97
Belmont	3, 311, 851	214, 545	56, 534		3, 582, 930	6, 914, 000	1. 93	7, 775	891	1, 085	867	10, 618	70	4. 83
Carroll	297, 084	102, 847	1, 575		401, 506	725, 000	1. 81	323	47	43	51	464	241	3. 59
Columbiana	214, 715	61, 244	3, 449		279, 408	576, 000	2. 06	391	67	34	56	548	151	3. 38
Coshocton	128, 948	39, 698	1, 555		170, 201	357, 000	2. 10	226	34	22	31	313	170	3. 20
Guernsey	558, 605	117, 303	15, 556		691, 464	1, 349, 000	1. 95	1, 557	217	284	201	2, 259	73	4. 22
Harrison	1, 934, 280	8, 243	52, 231		1, 994, 754	3, 258, 000	1. 63	792	128	101	829	1, 850	135	7. 96

Hocking	282, 554	57, 014	2, 870		342, 438	654, 000	1. 91	822	116	48	131	1, 117	74	. 15
Holmes		7, 469			7, 469	20, 000	2. 68	14	1	1	1	17	228	1. 93
Jackson	72, 055	88, 261	4, 348		164, 664	419, 000	2. 54	225	29	38	34	326	159	3. 17
Jefferson	2, 291, 686	612, 037	41, 381		2, 945, 104	5, 851, 000	1. 99	3, 403	541	502	934	5, 380	109	5. 03
Lawrence	262	123, 373			123, 635	250, 000	2. 02	139	18	14	13	184	244	2. 76
Mahoning	304	36, 995	270		37, 569	110, 000	2. 93	59	7	5	13	84	210	2. 13
Medina, Summit, and Wayne		10, 280	629		10, 909	48, 000	4. 40	19	2	4	4	29	227	1. 66
Meigs	1, 055, 901	32, 405	120		1, 088, 426	1, 918, 000	1. 76	994	201	111	162	1, 468	238	3. 11
Morgan, Noble, Scioto, and Washington	284, 403	3, 282	6, 211		293, 896	591, 000	2. 01	861	111	161	79	1, 212	60	4. 05
Muskingum	147, 669	53, 490	147		201, 306	437, 000	2. 17	290	36	13	30	369	137	3. 98
Perry	744, 341	44, 495	6, 069		794, 905	1, 413, 000	1. 78	1, 671	256	146	326	2, 399	67	4. 97
Portage	8, 029	8, 854	3, 286		20, 169	71, 000	3. 52	61	16	14	22	113	68	2. 61
Stark	128, 225	309, 382	6, 025		443, 632	1, 205, 000	2. 72	413	61	47	74	595	231	3. 23
Tuscarawas	568, 363	448, 289	968		1, 017, 620	1, 972, 000	1. 94	915	134	131	124	1, 304	168	4. 66
Vinton	54, 666	17, 763	2, 185		74, 614	129, 000	1. 73	104	10	23	12	149	128	3. 92
	13, 144, 135	2, 439, 062	216, 500		15, 799, 697	30, 376, 000	1. 92	24, 531	3, 290	3, 255	4, 467	35, 543	98	4. 52

OKLAHOMA

Coal	121, 480	2, 095	440		124, 015	$378, 000	$3. 05	115	12	15	14	156	213	3. 73
Craig		8, 284			8, 284	22, 000	2. 66	12	1	1	2	16	159	3. 25
Latimer	363, 608	2, 904	4, 806		371, 318	1, 178, 000	3. 17	342	72	65	79	558	235	2. 83
Le Flore	418, 072	26, 036	2, 831		446, 939	1, 351, 000	3. 02	572	99	90	89	850	168	3. 13
Okmulgee	862, 184	1, 221	5, 822		869, 227	2, 425, 000	2. 79	864	158	59	127	1, 208	180	4. 00
Pittsburg	1, 191, 201	5, 186	30, 911		1, 227, 298	3, 974, 000	3. 24	1, 390	339	242	243	2, 214	207	2. 68
Rogers	117, 695	3, 600			121, 295	336, 000	2. 77				120	120	193	5. 23
Tulsa	252, 991	14, 348	2, 091		269, 430	854, 000	3. 17	87	11	15	160	273	200	4. 93
Other counties (Haskell, Mayes, Muskogee, and Wagoner)	371, 054	2, 658	6, 536		380, 248	1, 052, 000	2. 77	36	8	6	351	401	190	4. 99
	3, 698, 285	66, 332	53, 437		3, 818, 054	11, 570, 000	3. 03	3, 418	700	493	1, 185	5, 796	197	3. 35

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[3] The output of this county is obtained from strip pits, in which the production per man per day is large.

TABLE 87.—*Production, value, men employed, days worked, and output per man per day at bituminous coal mines in specified States and counties in 1927*—Continued

PENNSYLVANIA (BITUMINOUS)

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Allegheny	8, 103, 712	2, 167, 468	77, 288		10, 348, 468	$22, 067, 000	$2. 13	9, 789	1, 488	1, 323	1, 759	14, 359	184	3. 92
Armstrong	5, 437, 986	165, 022	15, 021		5, 618, 029	9, 573, 000	1. 70	4, 399	502	398	726	6, 025	235	3. 97
Beaver	160, 232	137, 009	393		297, 634	669, 000	2. 25	181	33	10	105	329	231	3. 92
Bedford	438, 075	13, 939	2, 258	43, 135	497, 407	1, 124, 000	2. 26	746	63	96	83	988	157	3. 20
Blair and Fulton	225, 877	60, 189	4, 782	11, 108	301, 956	780, 000	2. 58	539	76	33	63	711	129	3. 29
Bradford and Lycoming	36, 450	2, 453			38, 903	99, 000	2. 54	58	4	4	16	82	210	2. 26
Butler	1, 737, 927	46, 819	6, 229		1, 790, 975	3, 415, 000	1. 91	1, 757	271	157	263	2, 448	192	3. 80
Cambria	12, 087, 475	2, 254, 184	111, 925	108, 794	14, 562, 378	32, 423, 000	2. 23	15, 192	1, 958	1, 844	2, 038	21, 032	168	4. 12
Center	892, 484	74, 515	765		967, 764	1, 866, 000	1. 93	1, 067	130	92	168	1, 457	185	3. 59
Clarion	1, 299, 078	110, 287	2, 494		1, 411, 859	2, 522, 000	1. 79	1, 516	197	116	235	2, 064	207	3. 30
Clearfield	4, 233, 290	184, 178	45, 079		4, 462, 547	9, 224, 000	2. 07	5, 909	620	561	824	7, 914	160	3. 53
Clinton	222, 498	28, 050	6, 757		257, 305	511, 000	1. 99	189	26	13	89	317	204	3. 97
Elk	736, 720	9, 132	24, 972		770, 824	1, 574, 000	2. 04	1, 189	110	95	138	1, 532	149	3. 38
Fayette	23, 201, 342	264, 786	416, 972	6, 199, 220	30, 082, 320	63, 816, 000	2. 12	13, 537	3, 202	5, 403	3, 934	26, 076	247	4. 68
Greene	6, 665, 690	34, 893	41, 996		6, 742, 579	12, 985, 000	1. 93	2, 685	642	1, 022	793	5, 142	255	5. 14
Huntingdon	307, 163	10, 341	13, 716		331, 220	882, 000	2. 66	731	113	33	74	951	120	2. 90
Indiana	8, 808, 915	273, 490	38, 611	293, 628	9, 414, 644	18, 034, 000	1. 92	7, 234	793	906	1, 191	10, 124	212	4. 39
Jefferson	2, 209, 300	60, 068	8, 738		2, 278, 106	4, 268, 000	1. 87	2, 700	279	282	391	3, 652	161	3. 86
Lawrence	211, 440	10, 131	10, 343		231, 914	695, 000	3. 00	207	49	16	36	308	279	2. 70
McKean and Venango	3, 788	8, 678			12, 466	32, 000	2. 57	21	1	5	9	36	246	1. 41
Mercer	283, 317	7, 211	13, 252		303, 780	823, 000	2. 71	321	76	46	53	496	237	2. 58
Somerset	9, 929, 572	183, 241	117, 407		10, 230, 220	20, 523, 000	2. 01	7, 799	1, 099	1, 004	1, 372	11, 274	225	4. 03
Tioga	106, 289	46, 768	3, 762		156, 819	517, 000	3. 30	306	58	38	79	481	115	2. 83
Washington	11, 662, 714	287, 209	79, 205		12, 029, 128	24, 529, 000	2. 04	11, 778	1, 971	1, 750	2, 358	17, 857	171	3. 94
Westmoreland	17, 023, 853	736, 978	275, 513	1, 789, 050	19, 825, 394	39, 763, 000	2. 01	11, 350	2, 117	1, 979	2, 598	18, 044	226	4. 86
	116, 025, 187	7, 177, 039	1, 317, 478	8, 444, 935	132, 964, 639	272, 714, 000	2. 05	101, 200	15, 878	17, 226	19, 395	153, 699	203	4. 26

SOUTH DAKOTA (LIGNITE)

Corson and Harding		720			720	$1, 300	$1. 81	6				6	72	1. 67
Dewey	1, 925	1, 850			3, 775	11, 500	3. 05	14				14	138	1. 95
Meade and Ziebach	1, 000	2, 250			3, 250	12, 700	3. 91	14				14	117	1. 99
Perkins		4, 762			4, 762	12, 500	2. 62	15				15	143	2. 22
	2, 925	9, 582			12, 507	38, 000	3. 04	49				49	125	2. 04

TENNESSEE

Anderson	995, 597	6, 881	2, 000		1, 004, 478	$1, 713, 000	$1. 71	729	138	100	135	1, 102	240	3. 80
Campbell	1, 047, 685	43, 695	5, 003		1, 096, 383	2, 118, 000	1. 93	1, 025	167	126	216	1, 534	226	3. 16
Claiborne	1, 017, 572	11, 345	2, 868		1, 031, 785	1, 841, 000	1. 78	689	151	139	110	1, 089	237	4. 00
Fentress	479, 651	10, 760	9, 422		499, 833	812, 000	1. 62	324	65	48	68	505	278	3. 56
Grundy	353, 461	2, 788	1, 859	41, 627	399, 735	789, 000	1. 97	478	57	49	101	685	207	2. 83
Hamilton	163, 582	14, 828	5, 843		184, 253	442, 000	2. 40	212	50	36	70	368	248	2. 02
Marion	252, 893	4, 891	4, 107		261, 891	532, 000	2. 03	308	43	28	85	464	195	2. 90
Morgan	301, 498	13, 226	7, 470	33, 369	355, 563	568, 000	1. 60	371	66	166	85	688	262	1. 97
Scott	154, 698	1, 566	6, 020		162, 284	247, 000	1. 52	138	22	28	50	238	175	3. 90
Other counties (Cumberland, Overton, Putnam, Rhea, Roane, Sequatchie, and White)	656, 496	8, 740	11, 093	110, 833	787, 162	1, 583, 000	2. 01	594	161	91	172	1, 018	245	3. 15
	5, 423, 133	118, 720	55, 685	185, 829	5, 783, 367	10, 645, 000	1. 84	4, 868	920	811	1, 092	7, 691	235	3. 20

TEXAS

Bituminous: Erath, Palo Pinto, Webb, and Wise	151, 371	2, 497	3, 031		156, 899	$597, 000	$3. 80	511	53	71	100	735	196	1. 09
Lignite: Anderson, Bastrop, Bexar, Henderson, Hopkins, Houston, Leon, Medina, Milam, Nacogdoches, Shelby, Titus, and Wood	1, 136, 838	12, 062	20, 586		1, 169, 486	1, 401, 000	1. 20	619	104	68	148	939	207	6. 03
	1, 288, 209	14, 559	23, 617		1, 326, 385	1, 998, 000	1. 51	1, 130	157	139	248	1, 674	202	3. 92

TABLE 87.—*Production, value, men employed, days worked, and output per man per day at bituminous coal mines in specified States and counties in 1927*—Continued

UTAH

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Carbon	4,014,008	25,183	25,631	142,184	4,207,006	$9,649,000	$2.29	1,691	379	283	533	2,886	212	6.87
Emery	376,245	5,488	202	-----	381,935	930,000	2.43	177	20	22	42	261	190	7.70
Other counties (Grand, Iron, Summit, and Uintah)	173,550	11,882	7,107	-----	192,539	505,000	2.62	100	30	21	41	192	192	5.23
	4,563,803	42,553	32,940	142,184	4,781,480	11,084,000	2.32	1,968	429	326	616	3,339	209	[4] 6.84

VIRGINIA

County	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Value Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total	Average number of days worked	Average tons per man per day
Dickenson	1,045,249	8,642	4,485	-----	1,058,376	$1,671,000	$1.58	577	148	115	150	990	256	4.18
Lee	2,170,027	8,637	2,033	-----	2,180,697	3,904,000	1.79	1,146	309	268	333	2,056	238	4.45
Montgomery	93,111	2,625	692	-----	96,428	266,000	2.76	184	31	24	67	306	115	2.74
Russell	1,498,959	16,657	2,941	-----	1,518,557	2,460,000	1.62	738	230	178	205	1,351	225	4.99
Tazewell	2,234,674	13,040	6,543	-----	2,254,257	4,460,000	1.98	889	222	695	340	2,146	244	4.30
Wise	5,126,204	51,820	31,042	522,497	5,731,563	10,238,000	1.79	2,970	952	1,398	877	6,197	244	3.79
Other counties (Pulaski and Scott)	66,107	6,974	3,083	-----	76,164	204,000	2.68	86	23	16	40	165	151	3.07
	12,234,331	108,395	50,819	522,497	12,916,042	23,203,000	1.80	6,590	1,915	2,694	2,012	13,211	238	4.11

WASHINGTON

County	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Value Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total	Average number of days worked	Average tons per man per day
King	419,607	38,980	1,054	-----	459,641	$1,430,000	$3.11	353	89	116	227	785	182	3.22
Kittitas	1,158,932	18,910	20,756	-----	1,198,598	4,309,000	3.60	1,034	149	97	223	1,503	208	3.84
Lewis	46,541	17,672	2,111	-----	66,324	173,000	2.61	76	11	7	28	122	155	3.51
Pierce	274,590	8,753	10,914	47,953	342,210	1,471,000	4.30	214	47	138	160	559	244	2.51
Other counties (Cowlitz, Thurston, and Whatcom)	535,335	22,029	10,925	-----	568,289	1,839,000	3.24	290	59	15	74	438	244	5.31
	2,435,005	106,344	45,760	47,953	2,635,062	9,222,000	3.50	1,967	355	373	712	3,407	210	3.68

WEST VIRGINIA

Barbour	2, 856, 348	30, 718	10, 575	32, 280	2, 929, 921	$4, 133, 000	$1. 41	1, 731	335	212	238	2, 516	210	5. 56
Boone	3, 925, 854	19, 335	8, 912		3, 954, 101	6, 432, 000	1. 63	1, 954	453	446	486	3, 339	240	4. 94
Braxton	256, 632	41, 570	7, 865		306, 067	459, 000	1. 50	176	40	32	57	305	211	4. 75
Brooke	1, 063, 760	855, 470	21		1, 919, 251	3, 675, 000	1. 91	1, 227	246	161	160	1, 794	203	5. 28
Clay	961, 169	26, 102	10, 876		998, 147	1, 811. 000	1. 81	422	144	96	117	779	269	4. 77
Fayette	12, 088, 693	154, 028	39, 452	485, 066	12, 767, 239	24, 393, 000	1. 91	7, 081	2, 202	1, 515	1, 903	12, 701	233	4. 31
Gilmer	165, 699	3, 281	5, 212		174, 192	244. 000	1. 40	77	20	12	26	135	268	4. 82
Greenbrier	1, 548, 787	43, 304	9, 007		1, 601, 098	2, 587, 000	1. 62	707	272	157	167	1, 303	246	4. 99
Hancock		24, 697	74		24, 771	47, 000	1. 90	34	2	5	5	46	168	3. 21
Harrison	9, 091, 694	228, 786	4, 150		9, 324, 630	13, 816, 000	1. 48	4, 380	1, 074	872	746	7, 072	232	5. 68
Kanawha	7, 758, 762	76, 595	26, 824		7, 862, 181	12, 685, 000	1. 61	4, 955	1, 103	850	996	7, 904	221	4. 51
Lewis	16, 603	11, 093			27, 696	37, 000	1. 34	42	6	5	15	68	126	3. 22
Lincoln	320, 399	1, 568	1, 592		323, 559	447, 000	1. 38	209	58	48	65	380	190	4. 48
Logan	22, 727, 047	155, 870	22, 170		22, 905, 087	36, 338, 000	1. 59	7, 574	2, 030	1, 891	2, 101	13, 596	258	6. 53
McDowell	20, 908, 627	151. 091	157, 720	197, 988	21, 418, 426	42, 498, 000	1. 98	8, 317	2, 195	4, 556	3, 808	18, 876	219	5. 18
Marion	8, 553, 371	78, 076	76, 663		8, 708, 110	14, 550, 000	1. 67	4, 076	1, 016	1, 290	813	7, 195	238	5. 09
Marshall	2, 232, 468	351, 540	15, 405		2, 599, 413	4, 448, 000	1. 71	1, 433	230	221	219	2, 103	273	4. 53
Mason	20, 503	31, 811	1, 325		53, 639	98, 000	1. 83	48	14	9	12	83	158	4. 08
Mercer	4, 063, 980	29, 310	5, 380	22, 096	4, 120, 766	7, 898, 000	1. 92	1, 655	488	647	789	3, 579	247	4. 66
Mineral	323, 052	8, 071	2, 112		333, 235	617, 000	1. 85	392	52	71	80	595	170	3. 29
Mingo	6, 026, 779	44, 257	8, 140		6, 079, 176	9, 283, 000	1. 53	2, 385	857	684	834	4, 760	253	5. 05
Monongalia	8, 831, 089	167, 152	937	29, 835	9, 029, 013	13, 032, 000	1. 44	4, 013	854	748	883	6, 498	232	6. 00
Nicholas	151, 433	2, 335	5, 740		159, 508	330, 000	2. 07	150	29	31	37	247	189	3. 42
Ohio	2, 311, 758	278, 495	3, 579		2, 593, 832	4, 537, 000	1. 75	1, 672	250	198	193	2, 313	271	4. 14
Preston	1, 805, 468	57, 236	8, 917	100, 901	1, 972, 522	3, 302, 000	1. 67	1, 433	250	231	290	2, 204	189	4. 73
Putnam	408, 328	4, 568			412, 896	830, 000	2. 01	289	24	141	63	517	252	3. 17
Raleigh	14. 750, 649	119, 732	66, 005		14, 936, 386	28, 250, 000	1. 89	6, 112	2, 187	1, 531	1, 902	11, 732	254	5. 01
Randolph	530, 037	18, 024	13, 534	27, 112	588, 707	832, 000	1. 41	379	106	50	98	633	151	6. 14
Taylor	1, 619, 518	18, 072			1, 637, 590	2, 339. 000	1. 43	943	219	89	176	1, 427	233	4. 93
Tucker	1, 015, 801	41, 875	10, 671	1, 262	1, 069. 609	2, 254, 000	2. 11	738	28	218	99	1, 083	230	4. 28
Upshur	856, 098	12, 259	10, 893		879, 250	1, 195, 000	1. 36	509	87	57	87	740	228	5. 21
Webster	43, 854	24, 635	477		68, 966	178, 000	2. 58	86	15	4	10	115	190	3. 16
Wyoming	2, 859, 442	16, 870	14, 098		2, 890, 410	5, 476, 000	1. 89	1, 179	441	695	462	2, 777	227	4. 58
Other counties (Grant, Summers, and Wayne)	442, 411	2, 362	8, 280		453, 053	679, 000	1. 50	207	58	41	78	384	254	4. 64
	140, 536, 113	3, 133, 188	556, 606	896, 540	145, 122, 447	249, 730, 000	1. 72	66, 585	17, 385	17, 814	18, 015	119, 799	235	5. 15

WYOMING

Big Horn and Park		3, 883			3, 883	$18, 000	$4. 64	5	1	1	1	8	159	3. 06
Campbell, Converse, Johnson, and Weston	125, 092	20, 573	18, 700		164, 365	382, 000	2. 32	51	10	17	50	128	235	5. 46
Carbon, Fremont, Teton, and Uinta	568, 985	15, 576	22, 435		606, 996	1, 634, 000	2. 69	206	41	67	84	398	210	7. 25
Hot Springs	483, 186	8, 643	38, 288		530, 117	1, 806, 000	3. 41	366	99	80	87	632	196	4. 27
Lincoln	1, 097, 187	17, 240	49, 965		1, 164, 392	3, 331, 000	2. 86	775	113	161	223	1, 272	186	4. 91
Sheridan	899, 326	38, 629	2, 054		940, 009	2, 087, 000	2. 22	254	97	11	96	458	187	[5] 10. 96
Sweetwater	3, 261, 268	28, 536	54, 090		3, 343, 894	8, 894, 000	2. 66	1, 905	359	243	388	2, 895	183	6. 30
	6, 435, 044	133, 080	185, 532		6, 753, 656	18, 152, 000	2. 69	3, 562	720	580	929	5, 791	189	6. 18

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[4] The calculated output per man per day is affected by the practice of men going into certain mines to shoot and load coal on days when the tipples and mines as a whole are not in operation.

[5] The large output per man is due to the use of loading machines.

COAL PRODUCED AND CONSUMED IN ALASKA

The production of coal in Alaska in 1927 amounted to 104,300 tons, an increase of 17,000 tons over 1926 and not far short of the maximum of 119,826 established in 1923. In addition, 39,443 net tons was imported from the States and 30,492 tons from foreign countries, indicating a total consumption in the Territory of 174,235 tons. (See Table 88.)

TABLE 88.—*Coal produced and consumed in Alaska, 1918–1927*

Year	Produced in Alaska, chiefly subbituminous and lignite [1]		Imported from States, chiefly bituminous coal from Washington [2] (net tons)	Imported from foreign countries, chiefly bituminous coal from British Columbia [2] (net tons)	Total coal consumed (net tons)
	Net tons	Value			
1918	75,816	$413,870	51,520	37,986	165,322
1919	60,894	345,617	57,166	48,708	166,768
1920	61,111	355,668	38,128	45,264	144,503
1921	76,817	496,394	24,278	33,776	134,871
1922	79,275	430,639	28,457	34,251	141,983
1923	119,826	755,469	34,082	43,205	197,113
1924	99,663	559,980	40,161	41,980	181,804
1925	82,868	404,617	37,324	57,230	177,422
1926	87,300	459,000	35,620	34,254	157,174
1927	104,300	548,000	39,443	30,492	174,235

[1] Compiled by the Alaska branch of the U. S. Geological Survey.

[2] Compiled from records of the Bureau of Foreign and Domestic Commerce.

CUMULATIVE PRODUCTION, BY STATES, TO 1927

TABLE 89.—*Coal produced, by States, 1915–1927, with cumulative total production from the earliest record to the end of 1927, in thousands of net tons*

State	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	Total production from earliest record to end of 1927
Alabama	14,928	18,086	20,068	19,185	15,537	16,294	12,569	18,325	20,458	19,130	20,004	21,001	19,766	505,899
Arkansas	1,652	1,995	2,143	2,227	1,429	2,103	1,228	1,110	1,297	1,452	1,220	1,459	1,549	59,261
Colorado	8,625	10,484	12,483	12,408	10,323	12,278	9,123	10,020	10,346	10,444	10,311	10,637	9,724	320,739
Georgia	134	174	119	67	53	50	34	61	76	75	66	60	77	10,637
Illinois	58,830	66,195	86,199	89,291	60,863	88,725	69,603	58,468	79,310	68,323	66,909	69,367	46,848	1,932,037
Indiana	17,006	20,094	26,539	30,679	20,912	29,351	20,319	19,133	26,229	21,480	21,225	23,186	17,936	562,362
Iowa	7,614	7,261	8,966	8,192	5,625	7,814	4,531	4,335	5,711	5,468	4,715	4,626	2,950	271,861
Kansas	6,824	6,88[illegible]	7,185	7,562	5,225	5,926	3,467	2,955	4,443	4,248	4,524	4,416	3,444	203,659
Kentucky	21,362	25,394	27,808	31,613	30,036	35,691	31,588	42,134	44,777	45,147	55,069	62,924	69,124	751,179
Maryland	4,180	4,460	4,746	4,497	3,022	4,065	1,828	1,223	2,286	2,134	2,695	3,078	2,815	220,816
Michigan	1,156	1,180	1,375	1,465	996	1,490	1,142	929	1,172	831	808	687	757	38,183
Missouri	3,812	4,742	5,670	5,668	3,980	5,370	3,551	2,925	3,403	2,481	2,694	3,008	3,064	174,473
Montana	2,790	3,633	4,227	4,532	3,236	4,414	2,734	2,572	3,148	2,905	3,044	2,798	3,144	87,381
New Mexico	3,818	3,793	4,001	4,023	3,139	3,683	2,453	3,147	2,915	2,786	2,557	2,818	2,935	87,464
North Carolina	-------	-------	-------	1	7	12	23	78	36	57	65	58	53	869
North Dakota	528	635	791	720	841	949	865	1,327	1,385	1,200	1,325	1,370	1,528	19,394
Ohio	22,435	34,728	40,749	45,813	35,877	45,878	31,943	26,954	40,547	30,473	28,034	27,873	15,800	1,128,624
Oklahoma	3,694	3,608	4,387	4,813	3,802	4,849	3,363	2,803	2,885	2,330	2,326	2,843	3,818	108,983
Oregon	39	43	28	13	18	21	(1)	(1)	(1)	(1)	(1)	(1)	(1)	[2] 2,380
Pennsylvania, bituminous	157,955	170,295	172,448	178,551	150,758	170,608	116,014	113,148	171,880	130,634	136,928	153,042	132,965	4,835,154
Tennessee	5,730	6,137	6,194	6,831	5,213	6,662	4,460	4,877	6,040	4,557	5,454	5,789	5,783	203,422
Texas	2,089	1,988	2,356	2,261	1,681	1,615	973	1,106	1,187	1,147	1,008	1,091	1,326	48,801
Utah	3,109	3,567	4,125	5,137	4,631	6,005	4,079	4,992	4,720	4,488	4,690	4,374	4,781	96,055
Virginia	8,123	9,708	10,087	10,290	9,327	11,379	7,492	10,491	11,762	10,693	12,800	14,133	12,916	243,447
Washington	2,429	3,039	4,010	4,082	2,990	3,757	2,429	2,581	2,927	2,654	2,538	2,587	2,635	106,181
West Virginia	77,184	86,460	86,442	89,936	79,937	89,971	72,787	80,488	107,900	101,663	122,381	143,509	145,122	2,142,076
Wyoming	6,554	7,911	8,576	9,439	7,220	9,630	7,201	5,972	7,575	6,757	6,553	6,512	6,754	221,869
Other States	24	29	68	90	82	77	123	114	150	120	110	121	149	45,433
Total bituminous	442,624	502,520	551,790	579,386	465,860	568,667	415,922	422,268	564,565	483,686	520,053	573,367	517,763	14,428,639
Pennsylvania anthracite	88,995	87,578	99,612	98,826	88,092	89,598	90,473	54,683	93,339	87,927	61,817	84,437	80,096	3,642,992
Grand total	531,619	590,098	651,402	678,212	553,952	658,265	506,395	476,951	657,904	571,613	581,870	657,804	597,859	18,071,631

[1] Included under "Other States."

[2] Total through 1920.

DETAILED STATISTICS OF PENNSYLVANIA ANTHRACITE

STATISTICAL SUMMARY

The salient developments in the anthracite industry during the last decade are summarized in Table 1A. The course of the industry is traced through the varying conditions of the war and postwar period, including the forced demand of 1918, the reaction of 1919, the bituminous coal shortage of 1920, the strike of 1922 (the effects of which were apparent far into 1923), the great strike of 1925–26, and the subsequent readjustment. These changing conditions are reflected in the statistical record of production, consumption, and distribution; of sales realization and sizes shipped; and of men employed, time worked, and time lost through strikes.

TABLE 1A.—*Salient statistics of the Pennsylvania anthracite industry, 1918–1927*

	1918	1919	1920	1921	1922
Production:					
Loaded at mines for shipment—					
Breakers gross tons	70, 090, 234	64, 631, 703	63, 598, 683	67, 981, 416	37, 906, 503
Washeries do	6, 506, 487	3, 016, 903	4, 615, 514	1, 308, 436	2, 600, 481
Dredges do	124, 436	323, 689	396, 566	264, 711	566, 854
Sold to local trade and used by employees gross tons	2, 387, 892	2, 107, 876	2, 586, 163	2, 511, 206	2, 123, 393
Used at mines for steam and heat gross tons	9, 128, 526	8, 573, 580	8, 801, 511	8, 714, 098	5, 626, 896
Total do	88, 237, 575	78, 653, 751	79, 998, 437	80, 779, 867	48, 824, 127
Value at breaker, washery, or dredge	$336, 480, 000	$364, 927, 000	$434, 252, 000	$452, 305, 000	$273, 700, 000
Average sales realization per gross ton on breaker shipments:					
Stove	$5. 03	$6. 22	$7. 51	$7. 67	$8. 03
Pea	$3. 78	$4. 81	$5. 70	$5. 74	$5. 92
Total domestic	$4. 87	$6. 01	$7. 23	$7. 39	$7. 77
Buckwheat No. 1	$3. 16	$3. 17	$3. 76	$3. 43	$3. 56
Buckwheat No. 2	$2. 49	$2. 34	$2. 69	$2. 27	$2. 37
Total steam	$2. 66	$2. 63	$3. 22	$2. 75	$2. 77
All sizes	$4. 27	$5. 19	$6. 16	$6. 27	$6. 48
Percentage by sizes in total breaker shipments:					
Broken per cent	6. 9	4. 5	5. 2	3. 7	4. 3
Egg do	14. 6	14. 9	15. 6	15. 0	14. 5
Stove do	19. 0	20. 5	19. 3	21. 5	21. 5
Chestnut do	24. 1	26. 4	26. 3	27. 2	25. 8
Pea do	8. 3	9. 1	7. 9	8. 4	7. 8
Steam sizes do	27. 1	24. 6	25. 7	24. 2	26. 1
Exports gross tons	4, 436, 000	4, 443, 000	4, 825, 000	4, 176, 000	2, 366, 000
Imports do	33, 000	74, 000	28, 000	8, 000	209, 000
Consumption (calculated) do	82, 835, 000	72, 784, 000	76, 595, 000	73, 170, 000	50, 713, 000
Average number of days worked	293	266	271	271	151
Man days lost on account of strikes and lockouts	69, 644	235, 553	1, 815, 316	823, 279	19, 623, 026
Number of men on strike during year	19, 290	35, 139	96, 840	52, 117	142, 442
Average number of men employed	147, 121	154, 571	145, 074	159, 499	156, 849
Output per man per day gross tons	2. 04	1. 91	2. 04	1. 87	2. 06
Output per man per year do	600	509	552	506	312
Quantity cut by machines do	1, 658, 495	1, 406, 433	837, 565	874, 237	448, 922
Quantity produced by stripping do	2, 107, 306	1, 791, 856	1, 834, 322	1, 810, 527	847, 987
Distribution:					
Total receipts in New England[1] net tons	13, 621, 000	10, 578, 000	11, 255, 000	11, 374, 000	6, 471, 000
Exports to Canada do	4, 904, 678	4, 865, 912	4, 968, 282	4, 519, 216	2, 572, 450
Loaded into vessels at Lake Erie[2] net tons	3, 981, 625	4, 535, 688	4, 032, 989	4, 265, 714	1, 381, 946
Receipts at Duluth-Superior[3] net tons	1, 669, 473	1, 795, 257	1, 637, 477	1, 844, 642	566, 362

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[1] From records of the Massachusetts Special Commission on the Necessaries of Life.
[2] From records of the Ore and Coal Exchange.
[3] From records of the United States Engineer Office, Duluth, Minn.

TABLE 1A.—*Salient statistics of the Pennsylvania anthracite industry, 1918–1927*—Continued

	1923	1924	1925	1926		1927
Production:						
Loaded at mines for shipment—						
Breakers……gross tons..	69,288,426	67,592,270	46,615,423	65,826,189		61,129,944
Washeries……do….	3,754,287	1,060,354	872,276	1,067,810		1,317,623
Dredges……do….	384,999	318,357	519,776	354,947		494,653
Sold to local trade and used by employees……gross tons..	2,900,314	2,717,803	2,575,515	2,399,474		2,720,330
Used at mines for steam and heat……gross tons..	7,010,375	6,817,343	4,610,893	5,742,162		5,851,346
Total……do….	83,338,401	78,506,127	55,193,883	75,390,582		71,513,896
Value at breaker, washery, or dredge…	$506,787,000	$477,231,000	$327,665,000	$474,164,000		$420,942,000
				Old method [4]	New method [4]	
Average sales realization per gross ton on breaker shipments:						
Stove……	$8.56	$8.74	$8.79	$9.09	$9.14	$8.86
Pea……	$6.18	$5.60	$5.27	$5.98	$5.98	$5.90
Total domestic……	$8.23	$8.25	$8.30	$8.60	$8.66	$8.33
Buckwheat No. 1……	$3.48	$2.94	$2.49	$2.39	$2.52	[5] $2.56
Buckwheat No. 2……	$2.23	$1.93	$1.84	$1.78	$1.78	$1.78
Total steam……	$2.64	$2.25	$2.00	$1.88	$1.94	$1.98
All sizes……	$6.77	$6.70	$6.59	$6.78	$6.84	$6.50
Percentage by sizes in total breaker shipments:						
Broken……per cent..	5.0	2.7	2.6	1.6		1.0
Egg……do….	15.7	14.5	13.5	13.5		11.7
Stove……do….	19.6	22.2	24.4	25.1		25.9
Chestnut……do….	25.6	26.5	26.8	27.1		26.4
Pea……do….	8.0	8.3	5.6	5.5		6.2
Steam sizes……do….	26.1	25.8	27.1	27.2		28.8
Exports……gross tons..	4,545,000	3,587,000	2,838,000	3,598,000		2,969,000
Imports……do….	268,000	105,000	342,000	727,000		106,000
Consumption (calculated)……do….	77,602,000	72,069,000	57,197,000	68,947,000		66,671,000
Average number of days worked……	268	274	182	244		225
Man days lost on account of strikes and lockouts……	2,629,418	1,143,630	15,269,506	5,990.477		159,242
Number of men on strike during year.	135,585	71,273	147,928	145,376		20,478
Average number of men employed……	157,743	160,009	160,312	165,386		165,259
Output per man per day…gross tons..	1.97	1.79	1.89	1.87		1.92
Output per man per year……do….	529	491	345	456		433
Quantity cut by machines……do….	1,079,055	1,271,325	840,347	831,183		1,046,329
Quantity produced by stripping.do….	2,020,623	1,665,783	1,409,355	2,144,068		1,922,461
Distribution:						
Total receipts in New England [1]……net tons..	12,185,000	10,611,000	8.280,000	10,608,000		9,145,000
Exports to Canada……do….	4,988,837	3,927,999	3,096,815	3,941,718		3,238,564
Loaded into vessels at Lake Erie [2]……net tons..	3,512,079	3,094,088	1,793,516	2,857,917		1,918,389
Receipts at Duluth-Superior [3]……net tons..	1,419,984	1,289,994	790,132	1,272,973		981,194

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[1] From records of the Massachusetts Special Commission on the Necessaries of Life.

[2] From records of the Ore and Coal Exchange.

[3] From records of the United States Engineer office, Duluth, Minn.

[4] The figures under the heading "Old method" are computed so as to be exactly comparable with the earlier years. Those under the heading "New method" are based on a more accurate system of estimating the values of 1 company which reported quantities but not values and (except for buckwheat No. 1) are strictly comparable with the figures for 1927. (See Coal in 1926, p. 576, and also pp. 502–503 of the present report.)

[5] The average for buckwheat No. 1 in 1927 was computed according to the "Old method" and is comparable with the figure of $2.39 in 1926 and with those given for 1918 to 1925. (See pp. 502–503.)

CHANGES AFFECTING THE ANTHRACITE MARKET

The decline in anthracite shipments during 1927 has led to many inquiries as to where the losses occurred, to what extent they were affected by unusual weather conditions, and to what extent they were due to the competition of other fuels. A complete answer to these questions would require a long-time record of detailed comparative figures for small areas on all fuels used for domestic purposes. No such figures are available. A partial answer is given, however, by assembling such data as are accessible on the quantity of anthracite shipped to certain of the larger markets and on the trend of consumption of other house fuels. (Tables 1A and 2A.) To facilitate comparison the figures are expressed in net tons.

DECLINE IN TONNAGE MOVING TO NEW ENGLAND, CANADA, AND THE NORTHWEST

Over a period of years there has been a gradual downward trend in the tonnage taken by certain important anthracite markets for which data are available. (Table 1A.) This downward trend continued in 1927, although there was no shortage of supply as in 1922 and 1925. A decline in comparison with 1926, when consumers were buying to rebuild their depleted stocks, was perhaps to be expected, but the 1927 shipments also show a decline in comparison with 1924. Total shipments into New England were 1,463,400 net tons less than in 1926 and about the same amount below 1924. Receipts at Duluth-Superior Harbor were 291,800 tons lower than in 1926 and 772,900 tons below the average for the five years from 1917 to 1921. Exports to Canada in 1927 were 3,238,600 tons in comparison with 3,941,700 tons in the previous year, both figures showing a considerable drop from the 4,500,000 to 5,000,000 tons sent into the Dominion during the war and pre-war years. The total in 1927 for the three markets—shipments to New England, receipts at Duluth-Superior Harbor, and exports to Canada—was approximately 2,458,400 net tons less than in 1926, 3,874,800 tons less than in 1919, and 15.6 per cent below the average for the 10 years 1918 to 1927.

Although the above figures cover only about one-fifth of all anthracite shipments, they indicate a gradual decline of consumption in some large and important markets. The decline, moreover, has occurred in areas where both population and wealth have been increasing.

FUELS USED IN PLACE OF ANTHRACITE

During the prolonged interruptions of supply in 1922 and 1925 and 1926 some millions of tons in potential sales of anthracite were lost to competitive fuels. How much of the decline in anthracite shipments in 1927 can be attributed to continued use of other fuels is a question of wide interest to the industry. For the strike years of 1925 and 1926 the Bureau of Mines has accounted for an equivalent of 27,100,000 net tons of substitutes to replace a computed deficit of 25,000,000 net tons of anthracite. (Coal in 1926, p. 552.) Since 1926 anthracite has recovered the vast majority of its former customers, but still other customers have continued to use oil or competitive solid fuels, and a considerable portion of the gains made by both of the latter in 1925 and 1926 was retained during 1927. Table 2A shows the supply of the principal competitive fuels in each of the last four years.

Oil.—Continued rapid growth is shown in the consumption of oil by householders. In 1927, 11,000,000 barrels were burned in heating homes as against 9,080,000 barrels in 1926, an increase of 21 per cent. The figure of 11,000,000 barrels consumed in the 1927 calendar year is not strictly comparable with those for the years previous to 1926, which represented heating seasons. (See footnote 6, Table 2A.) It should be noted that the total quantity of oil burned by householders in 1927 was equivalent to only 2,750,000 tons of coal and that by no means all of it came in competition with or represents displacement of anthracite. In the North Atlantic States,[34] which constitute the largest hard-coal market, the consumption of oil for house heating increased from 3,228,104 barrels in 1926[35] to 3,646,618 barrels in 1927,[36] or only 13 per cent in comparison with the 21 per cent increase for the entire country.

In contrast to the rapid growth in the use of oil for househeating, the 14,800,000 barrels consumed for heating other buildings represents only a small increase over 1926. Moreover, some of the buildings included in these figures, particularly on the Pacific coast, have always burned oil, and many of the others probably used bituminous coal, which is widely employed in large buildings even in communities where householders prefer anthracite.

Coke.—There was a large increase in the use of coke for domestic heating during 1925 and 1926, and a portion of this gain was retained in 1927. Sales of domestic by-product coke declined 354,000 tons below 1926, but were still 1,890,000 tons above 1924. Sales of domestic beehive coke fell to 111,000 tons, and with the gradual elimination of the beehive coke oven this quantity will probably shrink further. Sales of gas-house coke continued at about the same level as in 1924 and 1925. Petroleum coke production was 1,145,200 tons, an increase of 150,000 tons over 1926. Of this quantity 450,000 tons were used as refinery fuel. While some of the remainder was offered as domestic fuel, no record of the tonnage sold to householders is available.

Gas.—At the same time that the use of domestic coke has been expanding there has been a parallel growth in the heating of homes with gas. Although the number so heated at present is still very small and would have very little material effect on the demand for anthracite, the movement has passed the experimental stage and is increasing at a rapid rate. In Massachusetts 1,740 homes are now heated with gas, an increase of 690 over 1926.[37]

Domestic fuel briquets.—In comparison with 1926 the production of fuel briquets showed a decrease of 24,864 tons, but in comparison with 1925 an increase of 131,098 and with 1924 an increase of 389,998. (Table 2A.) As demand in 1926 had been artificially stimulated by the anthracite strike, a decrease was anticipated in 1927. That the decline at a time when anthracite was abundant was only 2.5 per cent below the level of the strike year indicates a permanent growth in the use of briquets. Many of the 970,468 tons sold in 1927, however, went to regular customers, and only a portion of the output was purchased by former consumers of anthracite. The briquets sold to the latter, moreover, hardly represent a complete displacement of anthracite, since 359,438 tons of anthracite and semianthracite—or 38 per cent of the total raw material—were used in 1927 in their manufacture. (Fuel Briquets in 1927, p. 5.)

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[34] Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, and Maryland.

[35] Swanson, E. B., National Survey of Fuel-Oil Distribution, 1926: A report of the U. S. Bureau of Mines in cooperation with the American Petroleum Institute, 1927, pp. 9, 20–21.

[36] Swanson, E. B., Sources and Distribution of Motor Petroleum Products, Atlantic Coast States—1927: Information Circ. 6080, U. S. Bureau of Mines, 1928, pp. 8, 10–11.

[37] Massachusetts Special Commission on the Necessaries of Life; Summary of Fuels Used for Heating Homes in Massachusetts: May 16, 1928. The figures are for the 1926–27 and 1927–28 coal years.

Imports of fuel briquets and foreign anthracite.—Imports of fuel briquets in 1927, chiefly of German origin, were 60,601 tons, a decline of 51 per cent from 1926. Anthracite imports, chiefly from Wales, fell from the unusually high figure of 813,956 tons in 1926 to 119,030 tons in 1927. Since over 90 per cent of the foreign briquets and anthracite enter New England, where hard coal is the popular domestic fuel, the decline in imports of briquets and Welsh anthracite indicates chiefly tonnage regained for Pennsylvania anthracite.

Raw bituminous coal.—During the last strike many anthracite customers learned to burn raw bituminous coal, and approximately 17,000,000 tons were used in 1925 and 1926 to replace hard coal. (Coal in 1926, p. 551.) The public does not perhaps realize that the substitution of bituminous coal was assisted by the Anthracite Coal Service, which encouraged retail distributors to handle other fuels while anthracite was not available and which instructed both dealers and consumers in the proper methods of burning substitutes. Undoubtedly some householders continued to burn the cheaper soft coal when anthracite once more became abundant. This was probably most true of consumers on the fringe of the anthracite market in the Northwest and Middle West, where heavy freight charges handicap anthracite in competition with near-by supplies of soft coal. Accurate figures are lacking on the quantities of bituminous coal used for househeating in 1927, except for Massachusetts, where, according to the State Commission on the Necessaries of Life, the consumption of bituminous coal for heating homes was 600,000 tons in the coal year 1926–27 and 630,000 tons in 1927–28.

TABLE 2A.—*Commercial production of anthracite and total supplies of other fuels used for domestic purposes in the United States, 1924–1927*

The figures for 1925 and 1926 were affected by the great strike of the anthracite miners which lasted from Sept. 1, 1925, to Feb. 18, 1926]

	1924	1925	1926	1927
Solid fuels (net tons)				
Anthracite production:				
Shipments of domestic sizes	56, 576, 296	38, 305, 222	54, 096, 437	48, 999, 058
Shipments of buckwheat No. 1 [1]	9, 510, 508	6, 631, 604	8, 581, 966	9, 062, 977
Shipments of smaller steam sizes	11, 160, 695	8, 831, 546	12, 640, 417	12, 433, 251
Local sales	3, 043, 939	2, 884, 577	2, 687, 411	3, 046, 770
Total commercial production	80, 291, 438	56, 652, 949	78, 006, 231	73, 542, 056
Anthracite exported	4, 017, 785	3, 179, 006	4, 029, 683	3, 325, 507
Anthracite imported, chiefly from United Kingdom	117, 951	382, 894	813, 956	119, 030
Fuel briquets produced	580, 470	839, 370	995, 332	970, 468
Fuel briquets imported	38	6, 758	123, 593	60, 601
By-product coke sold for domestic use	2, 812, 771	4, 085, 068	5, 056, 568	4, 702, 529
Beehive coke sold for domestic use	139, 886	392, 698	386, 045	111, 103
Coke imported	82, 833	201, 579	284, 548	168, 859
Gas-house coke sold	(2)	(2)	(2)	(2)
Petroleum coke produced [3]	761, 100	991, 000	995, 300	1, 145, 200
Bituminous coal for domestic use [4]	(5)	(5)	(5)	(5)
Oil (barrels)				
Oil used for heating houses [6]	2, 800, 000	5, 000, 000	9, 080, 000	11, 000, 000
Oil used for heating offices, hotels, apartments, schools, hospitals, and buildings other than houses	(7)	[8] 12, 100, 000	14, 266, 000	14, 800, 000

[1] A considerable part of the buckwheat No. 1 is used for domestic purposes.

[2] About 1,300,000 tons a year.

[3] How much of the petroleum coke produced was used for house fuel is not known. It is known that 314,000 tons in 1925, about 408,000 tons in 1926, and 450,000 tons in 1927 were used for refinery fuel.

[4] During the anthracite strike about 17,000,000 tons of bituminous coal in addition to the normal consumption was used to replace anthracite.

[5] From 56,000,000 to 77,000,000 tons a year.

[6] Figures relate to heating seasons as follows: 2,800,000 barrels in season of 1923–24; 5,000,000 in season of 1924–25. The figures for 1926 and 1927 represent the calendar year.

[7] No data.

[8] Partly estimated

Summary.—Although by 1927 anthracite had regained the vast majority of its former customers, the decline in hard-coal shipments and the figures on sales of competitive fuels indicate some losses of trade which have not yet been recovered.

The data available do not permit a forecast, and they cover only a few of the many factors in the economic environment of the anthracite industry. Not the least significant factor is the determined and organized effort of the producers to recover and expand their markets.

ANTHRACITE COAL SERVICE EXTENDED

The Anthracite Coal Service, an agency of the anthracite operators' conference, increased its staff and opened additional offices during 1927. The engineers of the service continued to advise consumers concerning the size of anthracite and methods of combustion best suited for their specific types of heating apparatus. In addition, the training of retailers and their employees was undertaken. Complementing this first-hand contact with both consumers and retailers, an extensive advertising program was promulgated. Headquarters were maintained in Philadelphia and branch offices in Washington, D. C.; metropolitan area of New York; Boston, Mass.; Hartford, Conn.; Syracuse, N. Y.; Detroit, Mich.; Chicago, Ill.; Milwaukee, Wis.; and in Minneapolis and St. Paul, Minn. Retailers in other than branch-office cities have also been assisted by the service engineers. The service has become an important agency in developing the market for anthracite and in raising the standards of comfort and convenience in domestic heating.

THE MOUNT CARMEL CONFERENCE AND THE ORGANIZATION OF THE ANTHRACITE COOPERATIVE ASSOCIATION

The year 1927 was marked, among other things, by the anthracite cooperation conference at Mount Carmel, which met from November 9 to 11. The conference represented a united effort on the part of the operators, miners, distributors, consumers, and all others interested in the economic welfare of the anthracite region. An outgrowth of the three-day session was the appointment of a committee of 21, composed of members representing producers, miners, retailers, and consumers. In December this committee met in Wilkes-Barre, adopted a set of by-laws, elected officers, and approved the formation of a permanent organization under the name Anthracite Cooperative Association. The following is abstracted from a statement by a spokesman for the industry on the purpose, operation, and nature of the new organization:

> The Anthracite Cooperative Association is an outgrowth of the Mount Carmel conference. It has established headquarters in Wilkes-Barre and has about 10,000 individual members who pay dues of $1 a year. In addition to this, the association has received about $7,000 from banks and $6,000 from the anthracite operators.
>
> The association has been effective in obtaining in the anthracite region, and, to some extent, outside of it, a better understanding of the problems of the industry. Its purpose is frankly to forward the interests of anthracite, because anthracite is the main dependence of the five counties which the association represents.
>
> Its program is very largely educational. It has interested itself effectively in the effort to repeal the tonnage tax, to extend markets, secure a consideration of freight rates, and has, to a great extent, ameliorated antagonisms between various factions in the anthracite region.

Its organization includes equal representation of the public, the mine companies, and of labor, all of whom are represented on its board of directors. The public's representatives are the leading business men of the region. While the association has been in operation only a short time, its promise is for continued, useful activity.

TABLE 3A.—*Average retail prices of stove anthracite and of bituminous coal in representative cities, by months, 1924–1927, as reported by the Bureau of Labor Statistics*

[From Monthly Labor Review. All figures in net tons of 2,000 pounds except as noted. Prices represent sidewalk delivery. Grades of bituminous coal were not specified]

Month	Anthracite, white-ash stove				Bituminous coal		
	Baltimore[1]	Boston	New York	Chicago	Chicago	Detroit	Norfolk
1924							
January	$16.75	$16.00	$14.42	$17.00	$8.69	$9.48	$8.83
February	16.75	15.30	14.38	17.00	8.73	9.63	8.97
March	16.75	15.50	14.33	16.75	8.56	9.52	9.00
April	15.50	15.50	13.50	16.08	8.06	9.45	8.97
May	15.50	15.50	13.57	16.08	7.85	9.32	8.22
June	15.50	15.50	13.63	16.25	7.85	9.14	8.22
July	15.79	15.70	13.70	16.25	7.85	9.18	8.25
August	15.75	15.75	13.78	16.50	7.85	9.07	8.28
September	16.29	16.00	14.13	16.50	7.83	9.07	9.00
October	16.29	16.00	14.13	16.75	8.21	9.21	9.00
November	16.25	16.00	14.13	16.75	8.13	9.25	9.00
December	16.25	16.00	14.33	16.75	8.14	9.07	9.25
1925							
January	16.25	16.00	14.33	16.74	8.51	8.93	9.27
February	16.25	16.00	14.42	16.74	8.50	8.96	9.27
March	16.25	16.00	14.42	16.70	8.48	8.83	9.27
April	15.50	15.75	14.00	16.70	8.41	8.77	9.27
May	15.50	15.75	14.02	16.10	8.06	8.70	8.57
June	15.75	15.75	14.12	16.30	8.23	8.70	8.52
July	15.75	16.00	14.22	16.30	8.21	8.79	8.48
August	16.00	16.00	14.37	16.36	8.32	8.89	8.52
September	16.00	16.25	15.13	16.77	8.89	9.73	9.05
October	16.21	16.25	17.04	17.19	8.99	9.86	9.05
November	(2)	17.00	20.50	18.13	9.65	10.59	10.43
December	(2)	17.80	(2)	18.13	9.49	10.70	10.52
1926							
January	(2)	(2)	(2)	(2)	9.48	10.59	10.52
February	(2)	(2)	(2)	(2)	9.34	10.53	10.52
March	16.75	18.00	15.71	16.89	8.99	10.69	10.16
April	16.00	16.00	14.75	16.86	8.39	10.45	9.34
May	16.00	16.00	14.75	16.84	8.12	9.33	8.46
June	16.00	16.00	14.75	16.84	8.13	9.24	8.41
July	16.00	16.25	14.75	16.88	8.27	9.30	8.52
August	16.00	16.25	14.75	16.88	8.32	9.25	8.52
September	16.00	16.25	14.75	16.90	8.91	9.90	9.09
October	16.08	16.40	14.75	16.91	9.06	10.39	9.66
November	16.00	16.50	14.75	17.00	10.15	11.61	10.39
December	16.00	16.50	14.75	17.00	10.34	11.05	10.25
1927							
January	16.00	16.50	14.75	17.00	9.85	10.34	9.68
February	16.00	16.50	14.75	17.00	9.64	10.22	9.73
March	16.00	16.50	14.54	17.00	9.31	9.78	9.71
April	15.25	15.75	13.75	16.25	8.89	9.57	8.27
May	15.25	15.75	13.83	16.25	8.98	9.41	8.27
June	15.50	15.75	14.08	16.50	9.12	9.28	8.57
July	15.75	16.00	14.08	16.70	9.09	9.18	8.55
August	15.75	16.00	14.08	16.70	9.16	9.21	8.55
September	16.00	16.00	14.38	16.95	9.32	9.38	8.80
October	16.00	16.25	14.38	16.94	9.30	9.38	9.07
November	16.00	16.25	14.75	16.95	9.29	9.35	9.07
December	16.00	16.25	14.75	16.95	9.17	9.31	9.07

[1] Per gross ton.

[2] Insufficient data.

PRODUCTION IN THE LEHIGH, SCHUYLKILL, AND WYOMING REGIONS

The total production of Pennsylvania anthracite in 1927, including colliery fuel and local sales and dredge and washery coal, was 71,513,896 gross tons, and the total value at the mines was $420,942,000. Both tonnage and value were the lowest for any recent year of undisturbed production. A comparison of production in 1927 and 1926 shows a decline of 5.1 per cent in quantity and 11.2 per cent in value.

At this point it should be noted that the figures on value for 1926 and 1927 are strictly comparable with each other but not with those for earlier years. In 1926 a change was made in estimating the value of the production of one large company in the Wyoming region, which has reported its tonnage but not its value. The new method, fully explained in Coal in 1926 (pp. 555, 576–580), yields more accurate results than that formerly employed. The change, though slight, should be kept in mind when tables relating to values are considered.

Of the total production 62,942,220 tons consisted of shipments and 2,720,330 tons of local sales made within the anthracite region or in the vicinity of the river dredges and the mines of Sullivan County. The sum of the two items—65,662,550 gross tons—constituted the "commercial production," and in 1927 it brought a gross revenue of $414,666,010, or $6.32 per ton. In addition to shipments and local sales, 5,851,346 tons was used as colliery fuel in 1927. Its value for cost-keeping purposes is placed at $6,275,716.

From an analysis of production by regions (Table 4A) it is seen that 151,497 tons were produced in the Bernice Basin, Sullivan County, a detached outlier of the coal-bearing series lying north and west of the Wyoming area. The Lehigh region produced 9,871,110 tons, the Schuylkill region 22,211,705, and the Wyoming region 39,279,584 tons.

TABLE 4A.—*Anthracite produced, by regions, 1926 and 1927*

Region	Shipments		Local sales		Colliery fuel		Total	
	Gross tons	Value [1]	Gross tons	Value	Gross tons	Value	Gross tons	Value [1]
1926								
Lehigh:								
Breaker product	9, 381, 991	$58, 978, 535	253, 283	$1, 419, 655	616, 684	$1. 441, 264	10, 251. 958	$61, 839, 454
Washery product	16, 941	114, 987	52	290	468	1, 034	17, 461	116, 311
Dredge product			52, 272	61, 743			52, 272	61, 743
	9, 398, 932	59, 093, 522	305, 607	1, 481, 688	617, 152	1, 442, 298	10, 321, 691	62, 017, 508
Schuylkill:								
Breaker product	18, 149, 497	119, 592, 981	538, 745	3, 334, 170	2, 145, 598	1, 952, 545	20, 833, 840	124, 879, 696
Washery product	444, 064	1, 501, 716	3, 470	2, 550	32, 084	61, 663	479. 618	1, 565, 929
Dredge product	341, 410	324, 533	401, 674	418, 457	5, 280	10, 719	748, 364	753. 709
	18, 934. 971	121, 419. 230	943, 889	3, 755, 177	2, 182, 962	2, 024, 927	22, 061, 822	127, 199, 334
Wyoming:								
Breaker product	38, 088, 744	270, 248, 192	1, 133, 029	6, 599, 679	2, 820, 431	4, 112, 659	42, 042, 204	280, 960, 530
Washery product	606, 805	2, 547, 746	8, 407	4, 848	85, 617	124, 904	700, 829	2, 677, 498
Dredge product	13, 537	10, 830	2, 581	2, 116			16, 118	12, 946
	38, 709, 086	272, 806, 768	1, 144, 017	6, 606, 643	2, 906, 048	4, 237, 563	42, 759, 151	283, 650, 974
Sullivan County: Breaker product	205, 957	1, 215, 366	5, 961	42, 070	36, 000	39, 000	247, 918	1, 296, 436
Total breaker product	65. 826, 189	450, 035, 074	1, 931, 018	11, 395, 574	5, 618, 713	7, 545, 468	[2] 73, 375, 920	468, 976, 116
Total washery product	1, 067, 810	4, 164, 449	11, 929	7, 688	118, 169	187, 601	1, 197, 908	4, 359, 738
Total dredge product	354, 947	335, 363	456, 527	482, 316	5, 280	10, 719	816, 754	828, 398
Grand total	67, 248, 946	454, 534, 886	2, 399, 474	11, 885, 578	5, 742, 162	7, 743, 788	75, 390, 582	474, 164, 252
1927								
Lehigh:								
Breaker product	8, 702, 751	52, 962, 480	408, 160	1, 834, 358	684, 148	1, 641, 118	9, 795, 059	56, 437, 956
Dredge product	76, 051	89, 592					76, 051	89, 592
	8. 778, 802	53, 052, 072	408, 160	1, 834, 358	684, 148	1, 641, 118	9, 871, 110	56, 527, 548
Schuylkill:								
Breaker product	17, 549, 496	106, 293, 616	615, 832	3, 715, 533	2, 305, 978	957. 400	20, 471, 306	110, 966. 549
Washery product	898, 680	2, 205, 031	(3)	(3)	[3] 50, 076	[3] 20, 294	948, 756	2, 225, 325
Dredge product	418, 602	336, 645	368, 461	364, 091	4, 580	4, 479	791, 643	705, 215
	18, 866, 778	108, 835, 292	[3] 984, 293	[3] 4, 079, 624	[3] 2, 360, 634	[3] 982, 173	22, 211, 705	113, 897, 089

Wyoming:								
Breaker product	34, 759, 359	237, 473, 149	1, 321, 338	7, 559, 452	2, 641, 810	3, 432, 708	38, 722, 507	248, 465, 309
Washery product	418, 943	1, 233, 874	(3)	(3)	[3] 138, 134	[3] 179, 787	557, 077	1, 413, 661
	35, 178, 302	238, 707, 023	[3] 1, 321, 338	[3] 7, 559, 452	[3] 2, 779, 944	[3] 3, 612, 495	39, 279, 584	249, 878, 970
Sullivan County: Breaker product	118, 338	552, 239	6, 539	45, 950	26, 620	39, 930	151, 497	638, 119
Total breaker product	61, 129, 944	397, 281, 484	2. 351, 869	13, 155, 293	5, 658, 556	6, 071, 156	[4] 69, 140, 369	416, 507, 933
Total washery product	1, 317, 623	3, 438, 905	(3)	(3)	[3] 188, 210	[3] 200, 081	1, 505, 833	3, 638, 986
Total dredge product	494, 653	426, 237	368, 461	364, 091	4, 580	4, 479	867, 694	794, 807
Grand total	62, 942, 220	401, 146, 626	[3] 2, 720, 330	[3] 13, 519, 384	[3] 5, 851, 346	[3] 6, 275, 716	71, 513, 896	420, 941, 726

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[1] Value given for shipments is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated selling companies.

[2] Includes about 1,536,000 tons of culm-bank coal put through the breakers.

[3] An insignificant quantity reported as local sales is included under the colliery fuel.

[4] Includes about 1, 452, 000 tons of culm-bank coal put through the breakers.

By limiting a comparison to shipments and by excluding Sullivan County, as is done in the following table, the relative importance of the three principal producing regions may be viewed back to the early days of the industry. During the last 20 years there have been only slight temporary changes in the relative percentages. From about 1830 up to the Civil War the Schuylkill region was the largest producer. (Coal in 1923, p. 705, fig. 53.) Thereafter the Wyoming region gained rapidly and since 1885 has supplied 50 per cent or more of the shipments. In 1927 it contributed 56 per cent against 14 per cent for the Lehigh and 30 per cent for the Schuylkill region.

TABLE 5A.—*Anthracite shipped from the Lehigh, Schuylkill, and Wyoming regions, 1807–1927*

[Detailed figures for each year of the period 1820 to 1922 will be found in Coal in 1924, pp. 570–571. Beginning with 1914 the figures in this series include dredge shipments. Note, however, that Sullivan County is not included, because no record of it is available prior to 1890]

Year	Lehigh region		Schuylkill region		Wyoming region		Total (gross tons)
	Gross tons	Percentage	Gross tons	Percentage	Gross tons	Percentage	
1807					55		55
1820	365						365
1830	41, 750	23. 9	89, 984	51. 5	43, 000	24. 6	174, 734
1840	225, 313	26. 1	490, 596	56. 7	148, 470	17. 2	864, 379
1850	690, 456	20. 6	1, 840, 620	54. 8	827, 823	24. 6	3, 358, 899
1860	1, 821, 674	21. 4	3, 749, 632	44. 0	2, 941, 817	34. 6	8, 513, 123
1870	3, 239, 374	20. 0	4, 968, 157	30. 7	7, 974, 660	49. 3	16, 182, 191
1880	4, 463, 221	19. 0	7, 554, 742	32. 3	11, 419, 279	48. 7	23, 437, 242
1890	6, 329, 658	17. 3	10, 867, 822	29. 7	19, 417, 979	53. 0	36, 615, 459
1900	6, 918, 627	15. 3	13, 502, 732	30. 0	24, 686, 125	54. 7	45, 107, 484
1910	8, 627, 539	13. 3	17, 845, 020	27. 5	38, 433, 227	59. 2	64, 905, 786
1920	9, 939, 241	14. 6	20, 733, 428	30. 4	37, 517, 036	55. 0	68, 189, 705
1923	10, 154, 616	13. 9	22, 214, 576	30. 4	40, 777, 698	55. 7	73, 146, 890
1924	9, 288, 543	13. 5	19, 607, 200	28. 5	39, 917, 803	58. 0	68, 813, 546
1925	6, 719, 060	14. 0	13, 954, 495	29. 1	27, 229, 261	56. 9	47, 902, 816
1926	9, 398, 932	14. 0	18, 934, 971	28. 3	38, 709, 086	57. 7	67, 042, 989
1927	8, 778, 802	14. 0	18, 866, 778	30. 0	35, 178, 302	56. 0	62, 823, 882

PRODUCTION BY FIELDS AND COUNTIES

The classification by trade regions—Lehigh, Schuylkill, and Wyoming—is the one most commonly used by the trade. It is paralleled by the organization of the United Mine Workers, in which district No. 1 corresponds to the Wyoming trade region, district No. 7 to the Lehigh region, and district No. 9 to the Schuylkill region. In studies of costs of production and reserves, however, a classification adopted by geologists is the more useful because it corresponds more closely to the natural conditions that largely govern mining costs. The geologic classification recognizes four fields—the Northern, Eastern Middle, Western Middle, and Southern. The Northern field is identical with the Wyoming region. That part of the Southern field lying east of Tamaqua, known as the Panther Creek Valley, together with the Eastern Middle field, make up the Lehigh region. That part of the Southern field west of Tamaqua and the Western Middle field are together equivalent to the Schuylkill region. The Bernice Basin in Sullivan County is sometimes grouped with the Northern field.

Natural geological conditions that affect both the cost of mining and the output per man were originally most favorable in the Northern and Eastern Middle fields, where the beds were less faulted and folded and therefore much less steeply inclined than in the Western Middle and Southern fields; but the advantages of the former fields have so stimulated production that the easily accessible coal has been largely extracted in many of the collieries in these areas. Exhaustion of the virgin coal and the necessity of resorting to thinner seams and to second or even third mining[38] has offset the natural advantages. To-day the average output per man is lowest in the Northern field and highest in the Southern field, where the original natural handicaps were more severe. Between the Eastern and Western Middle fields there is only slight variation.

Natural conditions also affect the value of the product. In the Northern and Eastern Middle fields the yield of the profitable domestic sizes is high. In the Western Middle and particularly the Southern field it is comparatively low because of crushing of the coal by the faulting and folding of the beds. The joint effect of the geologic conditions and relative exhaustion of the workings is shown by the following statement covering operations in 1926 and 1927.

TABLE 6A.—*Daily output of deep-mined anthracite per man underground and per cent of domestic sizes in breaker shipments, by fields, 1926 and 1927*

Field	1926		1927	
	Gross tons of deep-mined coal produced per man underground per day [1]	Per cent of domestic sizes in breaker shipments	Gross tons of deep-mined coal produced per man underground per day [1]	Per cent of domestic sizes in breaker shipments
Northern	2.20	76.9	2.20	76.0
Eastern Middle	2.34	71.3	2.38	71.4
Western Middle	2.30	70.2	2.39	68.3
Southern	2.42	60.2	2.58	56.5
Average	2.25	72.8	2.30	71.2

[1] Excluding culm-bank and strip-pit coal. In 1925 the corresponding figures were: Northern, 2.29; Eastern Middle, 2.39; Western Middle, 2.32; and Southern, 2.49.

It will be seen that a day's labor in the Northern field will produce a much greater quantity of the domestic sizes upon which the industry depends for profit. The bulk of the unmined coal, however, lies in the Southern and Western Middle fields.

Table 7A gives details of production in each field from 1918 through 1927.

In Table 8A production and value are given by counties for those who may be interested in segregation of the data according to local political units.

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[38] Ashmead, D. C., Mining of Thin Coal Beds in the Anthracite Region of Pennsylvania: Bull. 245, Bureau of Mines, 1927, pp. 2–4.

TABLE 7A.—*Anthracite produced, by fields, 1918–1927, in gross tons*

[The figures of breaker product include a certain quantity of culm-bank coal, which in 1927 amounted to about 1,452,000 tons. Data for 1913–1917 will be found in Coal in 1925, p. 517]

Year	Northern field [1]				Eastern Middle field			Western Middle field			
	Breakers	Washeries	Dredges	Total	Breakers	Washeries	Total	Breakers	Washeries	Dredges	Total
1918	45, 213, 000	3, 529, 000	3, 000	48, 745, 000	7, 631, 000	112, 000	7, 743, 000	17, 289, 000	1, 486, 000	102, 000	18, 877, 000
1919	41, 650, 000	1, 801, 000	18, 000	43, 469, 000	7, 284, 000	288, 000	7, 572, 000	14, 983, 000	871, 000	247, 000	16, 101, 000
1920	40, 398, 000	2, 939, 000	29, 000	43, 366, 000	7, 010, 000	115, 000	7, 125, 000	16, 123, 000	942, 000	240, 000	17, 305, 000
1921	44, 629, 000	920, 000	35, 000	45, 584, 000	6, 862, 000	78, 000	6, 940, 000	16, 674, 000	319, 000	199, 000	17, 192, 000
1922	24, 971, 000	1, 032, 000	48, 000	26, 051, 000	4, 121, 000	36, 000	4, 157, 000	9, 651, 000	995, 000	194, 000	10, 840, 000
1923	43, 804, 000	1, 859, 000	28, 000	45, 691, 000	7, 039, 000	122, 000	7, 161, 000	16, 548, 000	1, 019, 000	194, 000	17, 761, 000
1924	44, 071, 000	552, 000	14, 000	44, 637, 000	6, 808, 000	6, 000	6, 814, 000	15, 136, 000	423, 000	204, 000	15, 763, 000
1925	30, 184, 000	359, 000	78, 000	30, 621, 000	4, 909, 000	----------	4, 909, 000	10, 633, 000	334, 000	248, 000	11, 215, 000
1926	42, 290, 000	701, 000	16, 000	43, 007, 000	6, 446, 000	18, 000	6, 464, 000	14, 483, 000	441, 000	255, 000	15, 179, 000
1927	38, 874, 000	557, 000	----------	39, 431, 000	6, 178, 000	----------	6, 178, 000	13, 673, 000	832, 000	351, 000	14, 856, 000

Year	Southern field				Total			
	Breakers	Washeries	Dredges	Total	Breakers	Washeries	Dredges	Total
1918	10, 369, 000	2, 356, 000	148, 000	12, 873, 000	80, 502, 000	7, 483, 000	253, 000	88, 238, 000
1919	10, 245, 000	913, 000	354, 000	11, 512, 000	74, 162, 000	3, 873, 000	619, 000	78, 654, 000
1920	10, 137, 000	1, 673, 000	392, 000	12, 202, 000	73, 668, 000	5, 669, 000	661, 000	79, 998, 000
1921	10, 341, 000	400, 000	323, 000	11, 064, 000	78, 507, 000	1, 717, 000	556, 000	80, 780, 000
1922	6, 331, 000	880, 000	565, 000	7, 776, 000	45, 074, 000	2, 943, 000	807, 000	48, 824, 000
1923	11, 077, 000	1, 016, 000	632, 000	12, 725, 000	78, 468, 000	4, 016, 000	854, 000	83, 338, 000
1924	10, 654, 000	119, 000	519, 000	11, 292, 000	76, 669, 000	1, 100, 000	737, 000	78, 506, 000
1925	7, 639, 000	229, 000	581, 000	8, 449, 000	53, 365, 000	922, 000	907, 000	55, 194, 000
1926	10, 157, 000	38, 000	546, 000	10, 741, 000	73, 376, 000	1, 198, 000	817, 000	75, 391, 000
1927	10, 415, 000	117, 000	517, 000	11, 049, 000	69, 140, 000	1, 506, 000	868, 000	71, 514, 000

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[1] Includes Sullivan County, which in 1927 contributed 151,000 tons of breaker product.

TABLE SA.—*Anthracite produced, by counties, 1926 and 1927*

County	Shipments		Local sales		Colliery fuel		Total	
	Gross tons	Value [1]	Gross tons	Value	Gross tons	Value	Gross tons	Value [1]
1926								
Berks [2]	11, 000	$18, 000	23, 000	$49, 000			34, 000	$67, 000
Carbon	2, 189, 000	12, 783, 000	39, 000	240, 000	72, 000	$241, 000	2, 300, 000	13, 264, 000
Columbia	560, 000	3, 449, 000	25, 000	86, 000	74, 000	140, 000	659, 000	3, 675, 000
Dauphin	798, 000	5, 066, 000	305, 000	440, 000	97, 000	188, 000	1, 200, 000	5, 694, 000
Lackawanna	15, 670, 000	108, 800, 000	360, 000	2, 247, 000	916, 000	1, 440, 000	16, 946, 000	[3] 112, 487, 000
Luzerne	26, 639, 000	188, 751, 000	959, 000	5, 290, 000	2, 345, 000	3, 621, 000	29, 943, 000	[3] 197, 662, 000
Northumberland	4, 978, 000	31, 737, 000	156, 000	908, 000	537, 000	523, 000	5, 671, 000	33, 168, 000
Schuylkill	15, 432, 000	98, 184, 000	417, 000	2, 393, 000	1, 615, 000	1, 478, 000	17, 464, 000	102, 055, 000
Sullivan	206, 000	1, 215, 000	6, 000	42, 000	36, 000	39, 000	248, 000	1, 296, 000
Cumberland, Lancaster, and York [2]	72, 000	82, 000	43, 000	37, 000			115, 000	119, 000
Montour and Northampton [2]			53, 000	65, 000			53, 000	65, 000
Susquehanna and Wayne	694, 000	4, 450, 000	14, 000	89, 000	50, 000	73, 000	758, 000	4, 612, 000
	67, 249, 000	454, 535, 000	2, 400, 000	11, 886, 000	5, 742, 000	7, 743, 000	75, 391, 000	474, 164, 000
1927								
Carbon	2, 097, 000	11, 686, 000	44, 000	283, 000	90, 000	269, 000	2, 231, 000	12, 238, 000
Columbia	497, 000	2, 888, 000	32, 000	88, 000	61, 000	33, 000	590, 000	3, 009, 000
Dauphin	845, 000	4, 870, 000	271, 000	407, 000	119, 000	53, 000	1, 235, 000	5, 330, 000
Lackawanna	13, 711, 000	91, 611, 000	411, 000	2, 562, 000	837, 000	1, 113, 000	14, 959, 000	95, 286, 000
Luzerne	24, 743, 000	168, 621, 000	1, 231, 000	6, 265, 000	2, 328, 000	3, 456, 000	28, 302, 000	178, 342, 000
Northumberland	5, 528, 000	31, 277, 000	211, 000	1, 107, 000	594, 000	240, 000	6, 333, 000	32, 624, 000
Schuylkill	14, 660, 000	85, 636, 000	438, 000	2, 580, 000	1, 747, 000	1, 008, 000	16, 845, 000	89, 224, 000
Sullivan	118, 000	552, 000	7, 000	46, 000	27, 000	40, 000	152, 000	638, 000
Susquehanna and Wayne	583, 000	3, 831, 000	16, 000	100, 000	48, 000	63, 000	647, 000	3, 994, 000
Berks, Cumberland, Lancaster, Montour, Northampton, and York [2]	160, 000	175, 000	60, 000	82, 000			220, 000	257, 000
	62, 912, 000	401, 147, 000	2, 721, 000	13, 520, 000	5, 851, 000	6, 275, 000	71, 514, 000	420, 942, 000

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[1] Value given for shipments is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated selling companies.

[2] Counties producing dredge coal only.

[3] See Table 19A, footnote 4.

FRESH-MINED AND CULM-BANK COAL, BREAKER AND WASHERY PRODUCT

Reconciliation of fresh-mined, culm-bank, and breaker product.—Anthracite is now produced from three sources—from mines, from old culm banks, and from the rivers that drain the anthracite region. As all three sources contribute to the country's supply, it is important to cover them all in order to ascertain the total production. A full explanation of the method used in reconciling figures on production from the three sources is given in Coal in 1926, pages 562 and 563. No difficulty is experienced in separating the figures of production by dredges. Between the fresh-mined and the culm-bank coal, however, it is difficult to draw a sharp line that can be maintained throughout the statistics of the industry.

As the best solution of this problem, the individual breaker, washery, or dredge is taken as the unit in compiling the statistics. The producing companies are asked to supply separate statements for each breaker, washery, or dredge, and these are totaled to form the primary tables of this report in order to show the total quantity of "breaker product," "washery product," and "dredge product," with related figures of value, number of employees, and time worked.

The figures of breaker and washery product, however, are not exactly equivalent to the fresh-mined and culm-bank coal, because of the practice sometimes adopted of putting culm-bank coal through a breaker, either directly from the bank or after preliminary treatment in a washery. To obtain accurate statistics of the culm-bank coal, each company is now asked to recapitulate its total production of fresh-mined and culm-bank coal. The results are shown in Table 9A.

TABLE 9A.—*Comparison of anthracite production in 1923–1927 classified as fresh-mined, culm-bank, and river coal and as breaker, washery, and dredge product, in gross tons*

[Data in this form were not collected prior to 1923. See Coal in 1923, pp. 697–700, for interpretation of the records of fresh-mined and washery coal before that year]

	Classified by source of coal	Classified by type of preparation plant	Difference
1923			
Fresh-mined coal	76,135,538		+2,332,837
Breaker product		78,468,375	
Culm-bank coal	[1] 6,348,963		−2,332,837
Washery product		4,016,126	
River coal	853,900		
Dredge product		853,900	
	83,338,401	83,338,401	
1924			
Fresh-mined coal	75,656,355		+1,013,000
Breaker product		76,669,355	
Culm-bank coal	[1] 2,112,813		−1,013,000
Washery product		1,099,813	
River coal	736,959		
Dredge product		736,959	
	78,506,127	78,506,127	

[1] Includes about 2,300,000 tons of coal put through the breakers in 1923 and 1,013,000 ton in 1924.

TABLE 9A.—*Comparison of anthracite production in 1923–1927, etc.*—Continued

	Classified by source of coal	Classified by type of preparation plant	Difference
1925			
Fresh-mined coal	52,437,725		+927,000
Breaker product		53,364,725	
Culm-bank coal	[2] 1,849,276		−927,000
Washery product		922,276	
River coal	906,882		
Dredge product		906,882	
	55,193,883	55,193,883	
1926			
Fresh-mined coal	71,839,920		+1,536,000
Breaker product		73,375,920	
Culm-bank coal	[2] 2,733,908		−1,536,000
Washery product		1,197,908	
River coal	816,754		
Dredge product		816,754	
	75,390,582	75,390,582	
1927			
Fresh-mined coal	67,688,369		+1,452,000
Breaker product		69,140,369	
Culm-bank coal	[2] 2,957,833		−1,452,000
Washery product		1,505,833	
River coal	867,694		
Dredge product		867,694	
	71,513,896	71,513,896	

[2] Includes about 927,000 tons of coal put through the breakers in 1925, 1,536,000 tons in 1926, and 1,452,000 tons in 1927.

In 1927 out of 69,140,369 tons handled by the breakers 1,452,000 tons was culm-bank coal. The fresh-mined coal proper was 67,688,369 tons. The quantity handled by washeries was 1,505,833 tons, but including the 1,452,000 tons of bank coal run through breakers the total produced from culm banks was 2,957,833 tons.

Culm-bank coal.—The gradual cleaning up of the old culm banks and the declining prices of steam sizes have acted to reduce the quantity of culm-bank coal recovered in recent years. In comparison with the 6,348,963 tons recovered from banks in 1923, the total for 1927 shows a decrease of 53.4 per cent.

The practice of treating culm-bank coal in breakers is commonest in the Western Middle and Southern fields. Table 10A shows that in 1927, 313,000 tons were so handled in the Northern, 273,000 in the Eastern Middle, 333,000 in the Western Middle, and 533,000 in the Southern field.

TABLE 10A.—*Culm-bank coal put through breakers, by fields, 1924–1927, in gross tons*

Year	Northern	Eastern Middle	Western Middle	Southern	Total
1924	170,000	220,000	386,000	237,000	1,013,000
1925	173,000	181,000	396,000	177,000	927,000
1926	271,000	230,000	542,000	493,000	1,536,000
1927	313,000	273,000	333,000	533,000	1,452,000

A recently completed survey shows the quantity of culm, silt, and mixed materials now stored in banks in the anthracite fields.[39] The total quantity of culm and silt is estimated at approximately 214,225,000 tons, of which 92,085,000 tons represents culm. It should be noted that these tonnages do not represent recoverable marketable coal, for according to the survey the material comprising the culm and silt banks ranges from 20 to 80 per cent in combustible matter. Also, some of the banks are polluted with boiler ashes, rock, and other refuse, making future recovery of their combustible content problematical.

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[39] Sisler, J. D., Fraser, T., and Ashmead, D. C., Anthracite Culm and Silt (A Cooperative Study Between the Pennsylvania Topographic and Geologic Survey, the Pennsylvania Water and Power Resources Board, and the United States Bureau of Mines): Pennsylvania Topog. and Geol. Survey Bull. M 12, 1928, p. 21.

The following table, reproduced from the report referred to above, shows that the culm and silt banks of the Southern and Western Middle fields are by far the largest.

TABLE 11A.—*Quantity of culm and silt stored in banks in anthracite fields, in gross tons, according to J. D. Sisler, T. Fraser, and D. C. Ashmead* [1]

Field	Culm	Silt	Mixed	Total
Southern	37,745,000	36,815,000	10,000,000	84,560,000
Western Middle	43,785,000	40,735,000	17,175,000	101,695,000
Eastern Middle	2,430,000	6,200,000	1,385,000	10,015,000
Northern	8,125,000	8,035,000	1,795,000	17,955,000
Total for all fields	92,085,000	91,785,000	30,355,000	214,225,000

[1] Sisler, J. D., Fraser, T., and Ashmead, D. C., Anthracite Culm and Silt (A Cooperative Study Between the Pennsylvania Topographic and Geologic Survey, the Pennsylvania Water and Power Resources Board, and the United States Bureau of Mines): Pennsylvania Topog. and Geol. Survey Bull. M 12, 1928, p. 21.

Anthracite shipped from breakers, washeries, and dredges since 1890.—By limiting the comparison to shipments, the relative growth of breaker, washery, and dredge operations can be shown back to 1890. (Table 12A.) Washery shipments began to assume importance in the late nineties and reached their maximum in 1918, with 6,506,000 tons. For each year from 1924 to 1926 they were about a million tons but increased slightly in 1927 to 1,317,000 tons. The first statistical record of shipments by dredges was in 1909, when 9,000 tons were sold. The maximum tonnage of river coal shipped was reached in 1922. Dredge shipments in 1927 were 12.7 per cent below the previous record but 39.4 per cent above 1926.

TABLE 12A.—*Anthracite shipped from breakers, washeries, and dredges, 1890–1927, in gross tons*

[Includes shipments for Sullivan County, except for 1895, for which no data are available. Detailed figures for each year of the period up to 1924 will be found in Coal in 1924, p. 574]

Year	Breakers [1]	Washeries [1]	Dredges	Total
1890	36,573,000	42,000		36,615,000
1895	45,430,000	1,081,000		46,511,000
1900	43,218,000	2,059,000		45,277,000
1905	59,010,000	2,644,000		61,654,000
1910	62,417,000	3,296,000	22,000	65,735,000
1915	66,174,000	2,475,000	17,000	68,666,000
1917	72,077,000	5,366,000	47,000	77,490,000
1918	70,090,000	6,506,000	125,000	76,721,000
1919	64,632,000	3,017,000	323,000	67,972,000
1920	63,599,000	4,616,000	396,000	68,611,000
1921	67,981,000	1,308,000	265,000	69,554,000
1922	37,907,000	2,600,000	567,000	41,074,000
1923	69,289,000	3,754,000	385,000	73,428,000
1924	67,592,000	1,060,000	319,000	68,971,000
1925	46,615,000	872,000	520,000	48,007,000
1926	65,826,000	1,068,000	355,000	67,249,000
1927	61,130,000	1,317,000	495,000	62,942,000

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[1] In recent years a considerable tonnage of culm-bank coal has been handled in the breakers, so that the figures of shipments from washeries are less than the sales of culm-bank coal.

DETAILS OF SHIPMENTS BY REGIONS AND SIZES

TABLE 13A.—*Anthracite shipped, by regions and sizes, 1926 and 1927, in gross tons*

[The figures of shipments from breakers include a considerable tonnage of culm-bank coal handled in the breakers]

Size	Breaker shipments					Washery shipments	Dredge shipments	Grand total
	Lehigh region	Schuylkill region	Wyoming region	Sullivan County	Total			
1926								
Lump	5	5, 182	--------	--------	5, 187	--------	--------	5, 187
Broken	44, 326	166, 159	839, 656	3, 947	1, 054, 088	740	--------	1, 054, 828
Egg	870, 490	1, 895, 430	6, 102, 919	18, 851	8, 887, 690	35, 694	--------	8, 923, 384
Stove	2, 051, 169	4, 271, 004	10, 179, 478	39, 392	16, 541, 043	75, 198	--------	16, 616, 241
Chestnut	2, 423, 342	4, 714, 825	10, 627, 276	47, 977	17, 813, 420	188, 036	--------	[1] 18,001, 456
Pea	705, 794	1, 331, 694	1, 573, 007	25, 642	3, 636, 137	63, 057	100	3, 699, 294
Total domestic	6, 095, 126	12, 384, 294	29, 322, 336	135, 809	47, 937, 565	362, 725	100	48, 300, 390
Buckwheat No. 1	1, 098, 046	2, 323, 849	4, 091, 045	--------	7, 512, 940	148, 220	1, 310	7, 662, 470
Buckwheat No. 2 (rice)	690, 204	1, 467, 829	2, 859, 036	--------	5, 017, 069	345, 192	6, 109	5, 368, 370
Buckwheat No. 3 (barley)	1, 001, 692	1, 789, 065	1, 490, 532	--------	4, 281, 289	195, 999	205, 906	4, 683, 194
Boiler	186, 685	12, 193	61, 139	62, 231	322, 248	34	31, 510	353, 792
Other [2]	310, 238	172, 267	264, 656	7, 917	755, 078	15, 640	110, 012	880, 730
Total steam	3, 286, 865	5, 765, 203	8, 766, 408	70, 148	17, 888, 624	705, 085	354, 847	18, 948, 556
Grand total	9, 381, 991	18, 149, 497	38, 088, 744	205, 957	65, 826, 189	1, 067, 810	354, 947	67, 248, 946
1927								
Broken and lump [3]	34, 236	138, 707	438, 443	(4)	611, 386	(4)	--------	611, 386
Egg	673, 157	1, 731, 407	4, 703, 764	[4] 5, 798	7, 114, 126	[4] 7, 596	--------	7, 121, 722
Stove	2, 022, 548	3, 820, 266	9, 980, 305	21, 460	15, 844, 579	33, 467	--------	15, 878, 046
Chestnut	2, 255, 108	4, 381, 279	9, 502, 847	22, 995	16, 162, 229	88, 110	--------	16, 250, 339
Pea	681, 878	1, 265, 207	1, 823, 142	10, 254	3, 780, 481	107, 185	(5)	3, 887, 666
Total domestic	5, 666, 927	11, 336, 866	26, 448, 501	60, 507	43, 512, 801	236, 358	(5)	43, 749, 159
Buckwheat No. 1	1, 107, 964	2, 643, 590	4, 089, 100	--------	7, 840, 654	248, 881	[5] 2, 409	8, 091, 944
Buckwheat No. 2 (rice)	732, 357	1, 438, 235	2, 472, 765	--------	4, 643, 357	379, 797	(5)	5, 023, 154
Buckwheat No. 3 (barley)	943, 595	1, 855, 439	1, 417, 274	--------	4, 216, 308	426, 447	214, 264	4, 857, 019
Boiler	--------	8, 274	47, 028	--------	55, 302	--------	(6)	55, 302
Other [2]	251, 908	267, 092	284, 691	57, 831	861, 522	26, 140	[6] 277,980	1, 165, 642
Total steam	3, 035, 824	6, 212, 630	8, 310, 858	57, 831	17, 617, 143	1, 081, 265	494, 653	19, 193, 061
Grand total	8, 702, 751	17, 549, 496	34, 759, 359	118, 338	61, 129, 944	1, 317, 623	494, 653	62, 942, 220

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[1] Includes 16,409 tons of "range" coal.

[2] Includes buckwheat No. 4, silt, culm, screenings, and mine-run coal.

[3] The quantity of lump included is insignificant.

[4] A small amount of broken coal is included with egg.

[5] A small amount of pea and buckwheat No. 2 is included with buckwheat No. 1.

[6] A small amount of boiler coal is included with "Other."

TABLE 14A.—*Value of anthracite shipped, by regions and sizes, 1926 and 1927* [1]

Size	Breaker shipments										Washery shipments		Dredge shipments		Grand total	
	Lehigh region		Schuylkill region		Wyoming region		Sullivan County		Total							
	Total	Average per ton	Total	Average per ton	Total	Average per ton	Total	Average per ton	Total	Average per ton	Total	Average per ton	Total	Average per ton	Total	Average per ton
1926																
Lump	$43	$8.60	$48,311	$9.32					$48,354	$9.32					$48,354	$9.32
Broken	371,685	8.39	1,537,510	9.25	$6,684,994	$7.96	$33,550	$8.50	8,627,739	8.19	$5,916	$7.99			8,633,655	8.18
Egg	7,859,575	9.03	17,127,064	9.04	52,577,440	8.62	161,556	8.57	77,725,635	8.75	299,901	8.40			78,025,536	8.74
Stove	19,155,077	9.34	39,988,154	9.36	91,739,884	9.01	338,937	8.60	151,222,052	9.14	674,482	8.97			151,896,534	9.14
Chestnut	21,629,412	8.93	42,606,473	9.04	91,272,572	8.59	419,689	8.75	155,928,146	8.75	1,553,885	8.26			[2]157,482,031	8.75
Pea	4,304,830	6.10	8,054,717	6.05	9,258,384	5.89	138,477	5.40	21,756,408	5.98	363,977	5.77	$500	$5.00	22,120,885	5.98
Total domestic	53,320,622	8.75	109,362,229	8.83	251,533,274	8.58	1,092,209	8.04	415,308,334	8.66	2,898,161	7.99	500	5.00	418,206,995	8.66
Buckwheat No. 1	2,611,468	2.38	5,431,050	2.34	10,888,569	2.66			18,931,087	2.52	345,397	2.33	3,216	2.45	19,279,700	2.52
Buckwheat No. 2 (rice)	1,278,274	1.85	2,468,017	1.68	5,168,035	1.81			8,914,326	1.78	616,278	1.79	12,039	1.97	9,542,643	1.78
Buckwheat No. 3 (barley)	1,397,528	1.40	2,241,791	1.25	2,003,465	1.34			5,642,784	1.32	275,835	1.41	193,428	.94	6,112,047	1.31
Boiler	245,919	1.32	3,794	.31	85,690	1.40	111,879	1.80	447,282	1.39	45	1.32	29,866	.95	477,193	1.35
Other	124,724	.40	86,100	.50	569,159	2.15	11,278	1.42	791,261	1.05	28,733	1.84	96,314	.88	916,308	1.04
Total steam	5,657,913	1.72	10,230,752	1.77	18,714,918	2.13	123,157	1.76	34,726,740	1.94	1,266,288	1.80	334,863	.94	36,327,891	1.92
Grand total	58,978,535	6.29	119,592,981	6.59	270,248,192	7.10	1,215,366	5.90	450,035,074	6.84	4,164,449	3.90	335,363	.94	454,534,886	6.76
1927																
Broken and lump [3]	283,705	8.29	1,231,670	8.88	3,482,458	7.94	(4)	(4)	4,997,833	8.17	(4)	(4)			4,997,833	8.17
Egg	5,707,367	8.48	14,583,218	8.42	39,086,361	8.31	[4] 49,037	[4]8.46	59,425,983	8.35	[4] 64,626	[4]8.51			59,490,609	8.35
Stove	18,156,999	8.98	34,390,868	9.00	87,611,478	8.78	182,437	8.50	140,341,782	8.86	265,853	7.94			140,607,635	8.86
Chestnut	19,073,371	8.46	37,153,892	8.48	78,976,293	8.31	195,048	8.48	135,398,604	8.38	667,554	7.58			136,066,158	8.37
Pea	4,102,907	6.02	7,505,912	5.93	10,622,426	5.83	55,063	5.37	22,286,308	5.90	601,715	5.61	(5)	(5)	22,888,023	5.89
Total domestic	47,324,349	8.35	94,865,560	8.37	219,779,016	8.31	481,585	7.96	362,450,510	8.33	1,599,748	6.77	(5)	(5)	364,050,258	8.32

Buckwheat No. 1	2,806,022	2.53	6,583,858	2.49	10,686,720	2.61	--------	------	20,076,600	2.56	618,980	2.49	[5] 4,859	[5] 2.02	20,700,439	2.56
Buckwheat No. 2 (rice)	1,397,582	1.91	2,377,295	1.65	4,492,932	1.82	--------	------	8,267,809	1.78	649,443	1.71	(5)	(5)	8,917,252	1.78
Buckwheat No. 3 (barley)	1,318,479	1.40	2,319,540	1.25	1,936,137	1.37	--------	------	5,574,156	1.32	555,294	1.30	172,282	.80	6,301,732	1.30
Boiler	--------	------	2,407	.29	69,105	1.47	--------	------	71,512	1.29	--------	------	(6)	(6)	71,512	1.29
Other	116,048	.46	144,956	.54	509,239	1.79	70,654	1.22	840,897	.98	15,440	.59	[6] 249,096	[6] .90	1,105,433	.95
Total steam	5,638,131	1.86	11,428,056	1.84	17,694,133	2.13	70,654	1.22	34,830,974	1.98	1,839,157	1.70	426,237	.86	37,096,368	1.93
Grand total	52,962,480	6.09	106,293,616	6.06	237,473,149	6.83	552,239	4.67	397,281,484	6.50	3,438,905	2.61	426,237	.86	401,146,626	6.37

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[1] Value given is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated selling companies.

[2] Includes $142,294, value of "range" coal.

[3] The quantity of lump included is insignificant.

[4] A small amount of broken coal is included with egg.

[5] A small amount of pea and buckwheat No. 2 is included with buckwheat No. 1.

[6] A small amount of boiler coal is included with "Other."

TRENDS IN SIZES SHIPPED

Details on the quantity and value of each size shipped in 1925 and 1926 are given by regions in Tables 13A and 14A. Table 15A shows the relative percentage of each size in the total shipments of breaker coal from 1921 to 1927.

An outstanding feature of the market in 1927 was an increase in the demand for steam sizes. The total shipments of buckwheat and smaller sizes, including dredge and washery coal, increased from 18,949,000 tons in 1926 to 19,193,000 in 1927, although in the meantime there was a sharp decrease in shipments of the domestic sizes. (Table 13A.) The increase in the steam sizes was due to a recovery in washery and dredge shipments; the proportion of fine coal in the shipments from breakers (Table 15A) increased, but the actual tonnage was less than in 1926. Heretofore a steady demand for fine sizes has been ordinarily associated with either a shortage of domestic sizes or with high prices of bituminous coal. Neither of these occurred during the past year. The sign of strength in the steam-size group in 1927 is largely a result of the campaign for increased use of small sizes, particularly buckwheat, in domestic heating. It is also to be noted that since 1921 the percentage of steam sizes shipped from breakers has increased very gradually in comparison with a decline in the relative shipments of larger and more profitable sizes. (Table 15A.)

Within the group of domestic sizes the relative proportions of each size are affected by changes in the standards of sizing that have been made from time to time. In view of certain revisions undertaken in 1925 (for details of which see Coal in 1926, p. 572), special interest attaches to a comparison between the relative proportions of the five principal domestic sizes in 1927 with those in three preceding years. The following figures, abstracted from Table 15A, represent percentages of the total breaker shipments for the year:

	1923	1924	1926	1927
Broken	5.0	2.7	1.6	1.0
Egg	15.7	14.5	13.5	11.7
Stove	19.6	22.2	25.1	25.9
Chestnut	25.6	26.5	27.1	26.4
Pea	8.0	8.3	5.5	6.2

It will be seen that in comparison with 1923 there has been a sharp reduction in the percentages of broken and egg, a decline in the percentage of pea, and an increase in the percentages of chestnut and particularly stove. The net result has been to increase the available quantities of the sizes most in favor with the public.

TABLE 15A.—*Sizes of anthracite shipped from breakers, by regions, 1921–1927, in per cent of total*

[Note that shipments of dredge and washery coal are not included]

Region and size of coal	Percentage of total shipments						
	1921	1922	1923	1924	1925	1926	1927
Lehigh:							
Lump						(1)	(2)
Broken	1.9	1.8	1.7	1.0	1.1	.5	[2] 0.4
Egg	14.4	12.7	14.7	13.1	11.5	9.3	7.8
Stove	19.3	18.8	17.8	19.6	22.0	21.9	23.2
Chestnut	25.9	25.3	25.4	26.1	26.9	25.8	25.9
Pea	10.8	11.3	9.6	9.5	7.4	7.5	7.9
Total domestic	72.3	69.9	69.2	69.3	68.9	65.0	65.2
Buckwheat No. 1	13.6	14.7	14.3	13.7	12.8	11.7	12.7
Buckwheat No. 2 (rice)	6.6	7.8	7.4	7.1	7.6	7.3	8.4
Buckwheat No. 3 (barley)	6.2	6.7	7.7	8.7	8.6	10.7	10.8
Boiler	.2	.2	.2	(1)	(1)	2.0	
Other	1.1	.7	1.2	1.2	2.1	3.3	2.9
Total steam	27.7	30.1	30.8	30.7	31.1	35.0	34.8
Schuylkill:							
Lump	.1	(1)	.1	.1	(1)	(1)	(2)
Broken	3.3	3.5	3.5	1.7	1.5	.9	[2] .8
Egg	13.0	11.3	12.5	11.6	10.0	10.4	9.9
Stove	19.6	20.0	18.0	20.6	22.3	23.5	21.8
Chestnut	24.8	[3] 25.0	23.3	24.3	24.9	26.0	25.0
Pea	10.4	8.9	10.0	10.1	7.5	7.3	7.2
Total domestic	71.2	68.7	67.4	68.4	66.2	68.1	64.7
Buckwheat No. 1	17.3	16.2	16.9	15.4	14.4	12.8	15.0
Buckwheat No. 2 (rice)	5.9	6.2	6.4	5.7	7.9	8.1	8.2
Buckwheat No. 3 (barley)	5.4	7.8	8.5	9.8	10.5	9.9	10.6
Boiler	(1)	.2	(1)	(1)	(1)	.1	(1)
Other	.2	.9	.8	.7	1.0	1.0	1.5
Total steam	28.8	31.3	32.6	31.6	33.8	31.9	35.3
Wyoming:							
Lump	(1)						
Broken	4.2	5.3	6.6	3.6	3.6	2.2	1.3
Egg	16.2	16.6	17.7	16.2	15.8	16.0	13.5
Stove	23.0	23.1	20.9	23.5	25.9	26.7	28.7
Chestnut	28.6	[3] 26.5	[3] 26.8	[3] 27.8	[3] 27.6	[3] 27.9	27.3
Pea	6.8	6.4	6.5	7.1	4.2	4.1	5.3
Total domestic	78.8	77.9	78.5	78.2	77.1	76.9	76.1
Buckwheat No. 1	11.4	11.2	10.6	10.5	11.3	10.8	11.8
Buckwheat No. 2 (rice)	6.4	6.5	6.5	6.7	7.2	7.5	7.1
Buckwheat No. 3 (barley)	2.9	3.5	3.8	3.8	3.6	3.9	4.1
Boiler	.4	.4	.2	.2	.1	.2	.1
Other	.1	.5	.4	.6	.7	.7	.8
Total steam	21.2	22.1	21.5	21.8	22.9	23.1	23.9
Sullivan County:							
Lump							
Broken	4.4	4.2	5.0	.1	.4	1.9	(4)
Egg	10.7	6.4	10.0	7.7	8.8	9.2	[4] 4.9
Stove	18.5	9.9	16.4	14.5	17.1	19.1	18.1
Chestnut	27.6	15.4	21.8	18.6	22.3	23.3	19.4
Pea	14.6	9.1	15.8	9.6	11.5	12.4	8.7
Total domestic	75.8	45.0	69.0	50.5	60.1	65.9	51.1
Boiler, screenings, etc	24.2	55.0	31.0	49.5	39.9	34.1	48.9

[1] Less than one-tenth of 1 per cent.
[2] A small amount of lump coal is included with broken.
[3] Includes range coal.
[4] A small amount of broken coal is included with egg.

TABLE 15A.—*Sizes of anthracite shipped from breakers, by regions, 1921–1927, in per cent of total*—Continued

Region and size of coal	Percentage of total shipments						
	1921	1922	1923	1924	1925	1926	1927
Grand total:							
Lump	(1)	(1)	(1)	(1)	(1)	(1)	(2)
Broken	3.7	4.3	5.0	2.7	2.6	1.6	[2] 1.0
Egg	15.0	14.5	15.7	14.5	13.5	13.5	11.7
Stove	21.5	21.5	19.6	22.2	24.4	25.1	25.9
Chestnut	27.2	[3] 25.8	[3] 25.6	[3] 26.5	[3] 26.8	[3] 27.1	26.4
Pea	8.4	7.8	8.0	8.3	5.6	5.5	6.2
Total domestic	75.8	73.9	73.9	74.2	72.9	72.8	71.2
Buckwheat No. 1	13.3	13.0	12.9	12.3	12.4	11.4	12.8
Buckwheat No. 2 (rice)	6.3	6.6	6.6	6.5	7.4	7.6	7.6
Buckwheat No. 3 (barley)	4.0	5.2	5.7	6.1	6.2	6.5	6.9
Boiler	.2	.3	.2	.1	.1	.5	.1
Other	.4	1.0	.7	.8	1.0	1.2	1.4
Total steam	24.2	26.1	26.1	25.8	27.1	27.2	28.8

[1] Less than one-tenth of 1 per cent.
[2] A small amount of lump coal is included with broken.
[3] Includes range coal.

A summary of shipments by sizes for the last decade is given in Table 16A and brings out the relatively large proportion of the steam sizes in the 1927 shipments, to which attention has already been called. In the shipments of breaker coal, the percentage of sizes below pea was larger than in any year shown, and in the total shipments, including dredge and washery coal, it was larger than in any year except 1918, when shipments of washery coal were at a maximum.

TABLE 16A.—*Shipments of anthracite from breakers and total from all operations, classified by sizes, 1918–1927*

[A table separating shipments of domestic sizes from pea and steam for each year from 1890 to 1924, excluding however, Sullivan County and dredge coal, will be found in Coal in 1924, p. 575]

	Sizes above pea		Pea		Sizes below pea		Total (gross tons)
	Gross tons	Percentage of total	Gross tons	Percentage of total	Gross tons	Percentage of total	
Breaker product:							
1918	45,323,253	64.7	5,798,401	8.3	18,968,580	27.0	70,090,234
1919	42,937,454	66.4	5,884,492	9.1	15,809,757	24.5	64,631,703
1920	42,209,170	66.4	5,008,050	7.9	16,381,463	25.7	63,598,683
1921	45,796,115	67.4	5,720,904	8.4	16,464,397	24.2	67,981,416
1922	25,046,679	66.1	2,967,355	7.8	9,892,469	26.1	37,906,503
1923	45,651,693	65.9	5,544,915	8.0	18,091,818	26.1	69,288,426
1924	44,566,747	65.9	5,593,926	8.3	17,431,597	25.8	67,592,270
1925	31,359,250	67.3	2,608,744	5.6	12,647,429	27.1	46,615,423
1926	44,301,428	67.3	3,636,137	5.5	17,888,624	27.2	65,826,189
1927	39,732,320	65.0	3,780,481	6.2	17,617,143	28.8	61,129,944
Total shipments:[1]							
1918	45,994,903	60.0	6,471,381	8.4	24,254,873	31.6	76,721,157
1919	43,349,551	63.8	6,237,398	9.2	18,385,346	27.0	67,972,295
1920	42,984,656	62.6	5,457,588	8.0	20,168,519	29.4	68,610,763
1921	46,051,199	66.2	5,865,379	8.4	17,637,985	25.4	69,554,563
1922	25,409,723	61.8	3,278,136	8.0	12,385,979	30.2	41,073,838
1923	46,479,297	63.3	5,928,618	8.1	21,019,797	28.6	73,427,712
1924	44,825,550	65.0	5,689,000	8.2	18,456,431	26.8	68,970,981
1925	31,518,719	65.7	2,682,372	5.6	13,806,384	28.7	48,007,475
1926	44,601,096	66.3	3,699,294	5.5	18,948,556	28.2	67,248,946
1927	39,861,493	63.3	3,887,666	6.2	19,193,061	30.5	62,942,220

[1] Includes shipments of washery and dredge coal.

At this point it should be noted that the classifications used in the preceding tables are not always the same. Tables 13A, 14A, and the last half of Table 16A include all anthracite shipments. Table 15A and the first half of Table 16A include all shipments from breakers and exclude dredge and washery coal. These differences should be kept in mind when making comparisons.

LOCAL SALES

Shipments to points outside the mining area absorb most of the production of anthracite and provide most of the industry's gross revenue, but considerable tonnages are also sold in the thriving communities within the anthracite region itself. These "local sales" (as they are designated in the tables of this report) plus the shipments constitute the commercial or revenue-producing part of the production.

In 1927 local sales were 2,720,330 tons, or 3.8 per cent of the total output. For recent years they constitute from 3 to 4 per cent of the total production as against 2.4 per cent before the war. (Table 17A.) This relative increase is partly a result of the growth of population and of industries in Scranton, Wilkes-Barre, Hazleton, Pottsville, and other cities of the anthracite region. Another factor in this change is the development of electric central stations in the regions that burn the small sizes to generate electricity now bought by some operators who formerly generated their own power.

TABLE 17A.—*Disposition of total output of anthracite, 1890–1927, in per cent*

Year	Shipments	Local sales	Colliery fuel	Year	Shipments	Local sales	Colliery fuel
1890	88.3	4.3	7.4	1921	86.1	3.1	10.8
1895	89.8	2.3	7.9	1922	84.1	4.4	11.5
1900	88.4	2.1	9.5	1923	88.1	3.5	8.4
1905	88.9	2.0	9.1	1924	87.8	3.5	8.7
1910	87.1	2.4	10.5	1925	87.0	4.7	8.3
1915	86.4	2.4	11.2	1926	89.2	3.2	7.6
1920	85.8	3.2	11.0	1927	88.0	3.8	8.2

To throw light on the character of the local market the bureau addressed a supplementary inquiry to each producer of fresh-mined and culm-bank coal asking for a statement of the sizes sold locally in 1925, 1926, and 1927. The data obtained from those who could supply the information cover about two-thirds of the total local sales of breaker and washery coal and are given in Table 18A.

Local sales are seen to consist largely of chestnut, pea, and buckwheat No. 1, with very little of stove, egg, and broken. In the total breaker and washery shipments outside the region chestnut made up 26 per cent in 1927, while in the local sales of the companies reporting it made up 38.8 per cent. Pea made up only 6.2 per cent of the total shipments but comprised 23.7 per cent of the local sales of the companies reporting. The large proportion of pea in the trade within the region helps to explain the lower average value of the local sales as compared with the value of shipments.

TABLE 18A.—*Tabulation of reports of certain operators of breakers and washeries as to the sizes of anthracite sold locally in 1925–1927*

[Note that 65 per cent of the total local sales of breaker and washery products are accounted for in 1925, 66 per cent in 1926, and 82 per cent in 1927]

Size	1925		1926		1927	
	Gross tons accounted for	Per cent of total	Gross tons accounted for	Per cent of total	Gross tons accounted for	Per cent of total
Lump	87	----------	718	0.1	552	----------
Broken	7,938	0.5	9,376	.7	9,918	0.5
Egg	8,208	.5	9,271	.7	12,059	.6
Stove	43,390	3.0	44,461	3.5	64,405	3.4
Chestnut	580,573	41.0	558,312	43.5	742,616	38.8
Pea	349,177	24.6	320,496	25.0	454,439	23.7
Buckwheat No. 1	154,679	10.9	158,069	12.3	236,395	12.3
Buckwheat No. 2	88,007	6.2	47,665	3.7	171,911	9.0
Buckwheat No. 3	24,139	1.7	90,170	7.0	141,507	7.4
Boiler	153,306	10.9	34,523	2.7	78,763	4.1
Other	9,768	.7	10,344	.8	3,121	.2
	1,419,272	100.0	1,283,405	100.0	1,915,686	100.0

TRENDS IN VALUES AND PRICES

SOURCES OF INFORMATION AND METHODS OF ANALYSES

Margins of sales agents not included.—The figures of value in this study represent the value at the breaker or washery, as reported by the operating companies. In making its report the company is requested to "estimate value of the product not sold" and to "exclude selling expenses."

From this it will be seen that where a producing company sells its output to a separately organized sales company—the practice of many, including certain of the largest producers—the value reported will exclude the margin of the sales company and may therefore be somewhat less than the circular price at which the coal in question is placed on the general market. This fact should be borne in mind in considering the variations between different regions shown in the tables for the same sizes of coal.[40]

Estimates included in the figures of value.—The reports furnished are in writing and are signed by responsible officers of the mining companies. Complete reports have been received from all operators as to tonnage produced and other points touching the physical operation of the mines. A few companies made no reply on the value of the product, however, and to round out the totals estimates of these values have been made. The estimates represent only 12.5 per cent of the value shown in 1927, because aside from a few extremely small producers only one company failed to report. The values for this company, a producer in the Wyoming region, were estimated in 1927 as follows: The tonnage it reported of each size from broken to pea was multiplied by the company's average circular price for that size, as quoted in the trade journals for the year. The tonnage which it reported for buckwheat No. 1 and each smaller size was multiplied by the average sales realization obtained on that size by all other producers in the Wyoming region.

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[40] See Gordon, Ellery B., Distribution of Anthracite: U. S. Coal Commission Rept., pt. 2, pp. 677, 681, 682, for a statement of the marketing arrangements of the principal companies and the quantities handled through sales agents.

This method of computation gives results that are exactly comparable with 1926, with a single exception (buckwheat No. 1, which is discussed separately below). Before 1926 a different method of computation was used. The change in method introduced a slight break in the comparability of the figures, the extent of which was fully discussed in Coal in 1926, pages 576 to 580.

AVERAGE SALES REALIZATIONS, 1920–1927

The average sales realizations on each size from 1920 to 1927 are given in Table 19A. To insure comparability the table is based on shipments of breaker coal only, the dredge and washery product being excluded.

In considering the changes in sales realization it must be remembered that costs of production have also changed. Prices of mining supplies have fluctuated; State and local taxes have shown a tendency to grow; and wage rates were advanced sharply in November, 1920, and by an additional 10 per cent in September, 1923. As the workings grow deeper and resort is had to second and third mining and to progressively thinner beds the costs increase proportionately, except as better engineering can offset the increasing difficulties of nature. The report of the United States Coal Commission showed large increases in cost in the period from 1913 to March, 1923.[41] Since then no record of cost is available, but from the trend of wage scales and other factors it is indicated that the costs in 1927 were materially greater than in the period before September, 1923.

Increase in price of buckwheat in 1927.—In contrast to the steady reduction in the average sales realization on steam sizes from 1920 to 1926 in order to meet the pressure of low-price bituminous coal, there was a small gain in 1927. Computed in a manner to be exactly comparable from year to year, the averages have been as follows:

	1920	1921	1922	1923	1924	1925	1926	1927
Buckwheat No. 1	$3.76	$3.43	$3.56	$3.48	$2.94	$2.49	[1] $2.39	$2.56
Buckwheat No. 2 (rice)	2.69	2.27	2.37	2.23	1.93	1.84	1.78	1.78
All steam sizes	3.22	2.75	2.77	2.64	2.25	2.00	[1] 1.88	1.98

[1] These figures differ from the corresponding ones in Table 19A, in computing which the value of the buckwheat No. 1 shipped by one large company in the Wyoming region was taken at the company's circular price. The figures for 1926 here given are computed by taking the value of this company's tonnage at the average sales realization obtained by other shippers in the Wyoming region.

The average realization of $2.56 on buckwheat No. 1 in 1927 was lower than for any year from 1920 to 1924, but it represented a gain of 17 cents over 1926. This gain, in part a result of the campaign for increased use of buckwheat in domestic heating, was sufficient to raise the average receipts for the entire group of steam sizes by 10 cents a ton. Sales realizations on rice and barley, however, were the same as in 1926.

Declines on domestic sizes.—Average realizations on each of the domestic sizes, which, with the exception of pea and egg, had increased from 1920 to 1926, declined in 1927. (Table 19A.) On all domestic sizes combined, including pea, the decrease from 1926 to 1927 was 33 cents a ton. The decrease is partly explained by the fact that summer discounts were offered in 1927 but not in 1926, and partly by a decline in the price of independent coal.

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[41] Wing, David L., and Black, James E., Cost of Production of Anthracite: U. S. Coal Commission Rept., pt. 2, pp. 837–882.

Average value for all sizes.—This decrease in realizations on the domestic sizes more than offset the small gain on buckwheat, and the grand average for all sizes fell from $6.84 in 1926 to $6.50 in 1927. It should be noted that the decrease was not entirely due to declining prices, but was partly caused by the offering of summer discounts in 1927, already referred to, and by the fact that the shipments of 1927 contained an unusually large proportion of the steam sizes, which tend to depress the average.

The course of the average realization in the last four years is in striking contrast to the steady increase which characterized the period from 1916 to 1923. The companies have absorbed increasing costs either out of profits or through greater efficiencies in operation, and the industry has gone far to adjust its price structure to the changing needs of the market.

TABLE 19A.—*Average sales realization per gross ton on anthracite shipments from breakers, by regions and sizes, 1920–1927*

[Value does not include margins of separately incorporated sales companies]

Region and size of coal	1920	1921	1922	1923	1924	1925	1926	1927
Lehigh:								
Lump	$7.81	----	----	----	----	----	$8.60	(1)
Broken	7.07	$7.51	$7.73	$8.01	$8.32	$8.04	8.39	[1] $8.29
Egg	7.41	7.68	8.03	8.69	8.78	8.61	9.03	8.48
Stove	7.62	7.94	8.06	8.65	9.10	9.02	9.34	8.98
Chestnut	7.64	7.87	8.03	8.60	8.95	8.65	8.93	8.46
Pea	5.72	5.92	5.93	6.34	5.90	5.48	6.10	6.02
Total domestic	7.27	7.55	7.69	8.31	8.53	8.41	8.75	8.35
Buckwheat No. 1	3.80	3.49	3.66	3.60	2.96	2.53	2.38	2.53
Buckwheat No. 2 (rice)	3.03	2.40	2.55	2.49	2.08	1.92	1.85	1.91
Buckwheat No. 3 (barley)	2.03	1.54	1.75	1.55	1.48	1.45	1.40	1.40
Total steam [2]	3.07	2.66	2.86	2.70	2.25	1.95	1.72	1.86
Total all sizes	6.03	6.20	6.23	6.58	6.61	6.40	6.29	6.09
Schuylkill:								
Lump	6.99	7.50	7.70	8.35	5.18	8.85	9.32	(1)
Broken	7.55	7.76	8.30	8.79	8.71	8.67	9.25	[1] 8.88
Egg	7.47	7.63	8.12	8.85	8.75	8.62	9.04	8.42
Stove	7.71	7.81	8.27	8.87	9.16	9.06	9.36	9.00
Chestnut	7.76	7.92	[3] 8.28	8.86	9.00	8.75	9.04	8.48
Pea	5.80	5.80	6.07	6.35	5.68	5.30	6.05	5.93
Total domestic	7.38	7.52	7.97	8.49	8.50	8.45	8.83	8.37
Buckwheat No. 1	3.83	3.44	3.50	3.43	2.69	2.38	2.34	2.49
Buckwheat No. 2 (rice)	2.65	2.22	2.29	2.18	1.91	1.79	1.68	1.65
Buckwheat No. 3 (barley)	1.81	1.37	1.50	1.35	1.23	1.22	1.25	1.25
Total steam [2]	3.06	2.78	2.65	2.57	2.04	1.83	1.77	1.84
Total all sizes	5.98	6.15	6.30	6.56	6.46	6.21	6.59	6.06

[1] An insignificant quantity of lump is included with the broken coal.
[2] Includes all other steam sizes.
[3] Includes range coal.

TABLE 19A.—*Average sales realization per gross ton on anthracite shipments from breakers, by regions and sizes, 1920–1927*—Continued

Region and size of coal	1920	1921	1922	1923	1924	1925	1926	1927
Wyoming:								
Lump	$9.40	$5.21	-------	-------	-------	-------	-------	-------
Broken	6.75	7.20	$7.42	$7.57	$7.73	$7.78	[4] $7.96	$7.94
Egg	7.10	7.28	7.80	8.31	8.29	8.27	[4] 8.62	8.31
Stove	7.40	7.56	7.91	8.40	8.50	8.63	[4] 9.01	8.78
Chestnut	7.40	7.50	[3] 7.96	[3] 8.35	[3] 8.34	[3] 8.31	[3, 4] 8.59	8.31
Pea	5.60	5.64	5.80	5.96	5.45	5.14	[4] 5.89	5.83
Total domestic	7.15	7.30	7.70	8.09	8.08	8.21	[4] 8.58	8.31
Buckwheat No. 1	3.68	3.40	3.58	3.48	3.11	2.55	[4] 2.66	[5] 2.61
Buckwheat No. 2 (rice)[6]	2.62	2.25	2.35	2.18	1.91	1.85	1.81	1.82
Buckwheat No. 3 (barley)	2.02	1.48	1.57	1.40	1.29	1.38	1.34	1.37
Total steam [2]	3.06	2.77	2.83	2.67	2.40	2.15	[4] 2.13	2.13
Total all sizes	6.29	6.34	6.62	6.92	6.85	6.83	[4] 7.10	6.83
Total, including Sullivan County:								
Lump	7.33	7.01	7.70	8.35	5.18	8.85	[4] 9.32	(1)
Broken	7.02	7.37	7.65	7.85	7.93	7.94	[4] 8.19	[1] 8.17
Egg	7.23	7.42	7.91	8.49	8.45	8.39	[4] 8.75	8.35
Stove	7.51	7.67	8.03	8.56	8.74	8.79	[4] 9.14	8.86
Chestnut	7.53	7.66	[3] 8.07	[3] 8.53	[3] 8.59	[3] 8.48	[3, 4] 8.75	8.38
Pea	5.70	5.74	5.92	6.18	5.60	5.27	[4] 5.98	5.90
Total domestic	7.23	7.39	7.77	8.23	8.25	8.30	[4] 8.66	8.33
Buckwheat No. 1	3.76	3.43	3.56	3.48	2.94	2.49	[4] 2.52	[5] 2.56
Buckwheat No. 2 (rice)[6]	2.69	2.27	2.37	2.23	1.93	1.84	1.78	1.78
Buckwheat No. 3 (barley)	1.94	1.45	1.57	1.41	1.30	1.32	1.32	1.32
Total steam [2]	3.22	2.75	2.77	2.64	2.25	2.00	[4] 1.94	1.98
Total all sizes	6.16	6.27	6.48	6.77	6.70	6.59	[4] 6.84	6.50

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[1] An insignificant quantity of lump is included with the broken coal.

[2] Includes all other steam sizes.

[3] Includes range coal.

[4] The figures are based on complete reports of tonnage and value from all important producers except one company in Wyoming region which reported the tonnage of each size but not the value. To round out the totals estimates of the value of this company's shipments were made. In 1926 a change in the method of estimate was introduced which yields a more accurate result. The figures for 1926 and 1927, as shown above (except for buckwheat No. 1), are therefore strictly comparable with each other but not with those for earlier years. The effect of the change in method is shown by the following statement of the averages for 1926 if calculated according to the method of estimate used in 1920–1925.

	Broken	Egg	Stove	Chestnut	Pea	Total domestic	Buckwheat No. 1	Total steam	All sizes
Wyoming	$7.92	$8.49	$8.92	$8.48	$5.87	$8.48	$2.42	$2.02	$7.00
All regions	8.15	8.66	9.09	8.69	5.98	8.60	2.39	1.88	6.78

The change in method of estimate is fully discussed in Coal in 1926, p. 576.

[5] The average for buckwheat No. 1 in 1927 was computed according to the method used in 1920-1925. (See p. 501.)

[6] Includes bird's-eye coal.

AVERAGE VALUES OF SHIPMENTS, LOCAL SALES, AND COLLIERY FUEL

Table 20A shows by regions the average value per ton for all shipments, all local sales, and colliery fuel in each year from 1918 to 1927. The receipts from local sales average distinctly lower than those from shipments, a difference mainly accounted for by the large proportion of pea coal in the local sales. (See Table 18A.) In 1927 the shipments brought $6.37 and the local sales $4.97, or $1.40 less. These figures include the sales of dredges and washery coal, but even when the latter are excluded a difference in value is observed. For example, shipments of breaker coal in 1927 brought an average of $6.50 and local sales only $5.59.

TABLE 20A.—*Average value per gross ton of anthracite shipped, local sales, colliery fuel, and total production, by regions, 1918–1927* [1]

Year and region	Shipments	Local sales	Colliery fuel	Total
1918				
Lehigh	$4.01	$2.68	$1.36	$3.71
Schuylkill	4.13	3.33	.91	3.67
Wyoming	4.18	3.39	1.45	3.92
Sullivan County	3.97	3.99	2.29	3.79
	4.14	3.25	1.23	3.81
1919				
Lehigh	4.86	3.37	1.80	4.51
Schuylkill	4.94	3.43	.85	4.31
Wyoming	5.21	4.55	1.55	4.85
Sullivan County	4.63	4.70	2.29	4.36
	5.08	3.98	1.32	4.64
1920				
Lehigh	5.88	3.29	1.94	5.34
Schuylkill	5.70	4.14	.90	4.99
Wyoming	6.15	5.17	1.80	5.71
Sullivan County	5.60	5.71	2.33	5.27
	5.97	4.44	1.47	5.43
1921				
Lehigh	6.13	3.50	1.59	5.54
Schuylkill	6.03	4.19	.65	5.22
Wyoming	6.29	5.64	1.27	5.82
Sullivan County	6.21	6.20	2.30	5.53
	6.20	4.75	1.08	5.60
1922				
Lehigh	6.05	3.97	2.34	5.56
Schuylkill	5.78	4.44	.78	4.98
Wyoming	6.52	5.78	1.69	6.02
Sullivan County	5.22	6.18	2.00	4.84
	6.21	5.07	1.38	5.61
1923				
Lehigh	$6.36	$3.80	$1.77	$5.84
Schuylkill	6.31	3.87	.72	5.63
Wyoming	6.81	5.92	1.43	6.40
Sullivan County	6.81	6.56	2.60	6.73
	6.60	4.80	1.21	6.08
1924				
Lehigh	6.54	4.53	1.68	6.03
Schuylkill	6.33	4.05	.45	5.57
Wyoming	6.81	6.14	.97	6.36
Sullivan County	5.11	7.15	1.98	5.10
	6.63	5.15	.87	6.08
1925				
Lehigh	6.24	4.49	1.57	5.79
Schuylkill	5.98	4.06	.42	5.22
Wyoming	6.78	6.01	1.12	6.37
Sullivan County	5.49	6.93	1.85	5.05
	6.47	5.06	.88	5.94
1926				
Lehigh	6.29	4.85	2.34	6.01
Schuylkill	6.41	3.98	.93	5.77
Wyoming	[2] 7.05	5.77	1.46	[2] 6.63
Sullivan County	5.90	7.06	1.08	5.23
	[2] 6.76	4.95	1.35	[2] 6.29
1927				
Lehigh	6.04	4.49	2.40	5.73
Schuylkill	5.77	4.14	.42	5.13
Wyoming	6.79	5.72	1.30	6.36
Sullivan County	4.67	7.03	1.50	4.21
	6.37	4.97	1.07	5.89

[1] Value given for shipments is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated selling companies.

[2] See Table 19A, footnote 4. Had the same method of computation been used as in earlier years the average value for shipments for the Wyoming region would have been $6.94 and for all regions $6.70, and the average value of the total production for the Wyoming region would have been $6.54, and for all regions $6.24.

NUMBER OF OPERATIONS

Two hundred and thirty-five breakers produced anthracite in 1927, a smaller number than for any year since the beginning of the record in 1918. In comparison with 1926 there was a decrease of 4 in the number of active breakers, and in comparison with 1923 a decrease of 22. The number of breakers in 1927, however, was less than the total number of mines or workings, as a single breaker often handles the coal from several mines.

Although washery output increased 25.7 per cent in 1927, the number of active washeries declined from 38 in 1926 to 22. The number of river dredges also declined. The decreasing number of washeries and dredges in operation reflects the decline in prices of steam coal in recent years and the depletion of the old culm banks and the more accessible river deposits.

TABLE 21A.—*Number of anthracite breakers, washeries, and dredges active, 1918–1927*

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Lehigh:										
Breakers	34	34	36	33	32	33	33	32	33	32
Washeries	11	12	10	11	11	12	6	6	1	------
Dredges	------	3	3	1	4	3	3	2	1	2
	45	49	49	45	47	48	42	40	35	34
Schuylkill:										
Breakers	78	80	78	79	78	78	78	76	77	75
Washeries	25	24	19	17	24	26	13	7	11	9
Dredges	31	74	56	59	56	56	45	49	46	43
	134	178	153	155	158	160	136	132	134	127
Wyoming:										
Breakers	139	142	135	130	131	144	133	128	127	126
Washeries	40	42	33	27	34	44	22	22	26	13
Dredges	1	3	1	2	2	1	1	2	2	------
	180	187	169	159	167	189	156	152	155	139
Sullivan County: Breakers	3	3	3	3	2	2	3	2	2	2
Total breakers	254	259	252	245	243	257	247	238	239	235
Total washeries	76	78	62	55	69	82	41	35	38	22
Total dredges	32	80	60	62	62	60	49	53	49	45
Grand total	362	417	374	362	374	399	337	326	326	302

LABOR STATISTICS

No significant change in the average number of employees in the anthracite mines occurred in 1927. The total number of men and boys at work in the mines, dredges, and preparation plants, not including supervisory forces and office workers, was 165,259. This was only 127 less than the number employed in 1926, the largest in any year since 1915. In spite of a decline in production of about 3,900,000 tons in 1927, there was no appreciable reduction of the working force.

There were, however, some minor shifts within the labor force. Small gains in men employed occurred in the Lehigh and Schuylkill areas, but these were more than offset by a loss of 400 workers in the Wyoming region. For the anthracite district as a whole the tendency to increase the number of workers underground and to lessen the number employed on the surface continued. In comparison with the year before 966 more men were working underground and 1,093 less on the surface.

In 1927 additional information concerning the division of underground employments was obtained from producers, and the results are given in Table 22A. It will be seen that 50 per cent of the total working force engaged in the mining and preparation of anthracite consists of miners and miners' laborers; 11 per cent of haulage and track workers; 16 per cent of other underground workers, such as timbermen, brattice men, rock men, pump men, etc.; and 23 per cent of men or boys employed on the surface.

The average number of days worked by breakers was 225 in comparison with 245 in 1926. The loss in working time was largely a reflection of the fall in production. Dredges averaged 207 days and washeries 211 days. Washeries showed a large improvement over 1926 in working time (Table 22A), and there was an increase in tonnage, although the number of washery operations declined from 38 to 22 (Table 21A).

TABLE 22A.—*Men employed and days worked in the anthracite field, by regions, 1926 and 1927*

Region	1926					
	Average number employed					Average number of days worked
	Surface	Underground			Total	
		Miners and their laborers [1]	All others	Total		
Lehigh:						
Breakers	5,743	8,558	5,792	14,350	20,093	242
Washeries	33				33	240
Dredges	7				7	165
	5,783	8,558	5,792	14,350	20,133	242
Schuylkill:						
Breakers	13,885	22,586	12,880	35,466	49,351	238
Washeries	453				453	139
Dredges	334				334	216
	14,672	22,586	12,880	35,466	50,138	237
Wyoming:						
Breakers	18,059	50,490	25,453	75,943	94,002	249
Washeries	465				465	113
Dredges	2				2	110
	18,526	50,490	25,453	75,943	94,469	248
Sullivan County: Breakers	174	329	143	472	646	207
Total breakers	[2] 37,861	81,963	44,268	126,231	164,092	245
Total washeries	951				951	129
Total dredges	343				343	215
Grand total	39,155	81,963	44,268	126,231	165,386	244

Region	1927						
	Average number employed					Total	Average number of days worked
	Surface	Underground					
		Miners and their laborers [1]	Haulage and track	Other	Total		
Lehigh:							
Breakers	5,864	8,724	1,543	4,113	14,380	20,244	232
Dredges	9					9	156
	5,873	8,724	1,543	4,113	14,380	20,253	232
Schuylkill:							
Breakers	13,541	23,118	4,130	8,797	36,045	49,586	219
Washeries	402					402	208
Dredges	325					325	209
	14,268	23,118	4,130	8,797	36,045	50,313	218
Wyoming:							
Breakers	17,629	50,428	12,448	13,423	76,299	93,928	228
Washeries	141					141	218
	17,770	50,428	12,448	13,423	76,299	94,069	228
Sullivan County: Breakers	151	313	65	95	473	624	107
Total breakers	[2] 37,185	82,583	18,186	26,428	127,197	164,382	225
Total washeries	543					543	211
Total dredges	334					334	207
Grand total	38,062	82,583	18,186	26,428	127,197	165,259	225

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[1] Operators were requested to give number of "all miners (contract, consideration, and company) and their laborers."

[2] Includes a comparatively small number of washery employees who could not be separated from breaker employees.

TABLE 23A.—*Strikes, suspensions, and lockouts in the anthracite region, 1923–1927*

	Lehigh	Schuylkill	Wyoming	Sullivan County	Total
1923					
Total number employed	20, 639	49, 350	86, 978	776	157, 743
Men on strike	18, 593	43, 524	72, 772	696	135, 585
Man days lost account strike	354, 830	805, 640	1, 456, 364	12, 584	2, 629, 418
Average days lost:					
Per man employed	17	16	17	16	17
Per man on strike	19	19	20	18	19
1924					
Total number employed	20, 331	50, 456	88, 504	718	160, 009
Men on strike	10, 145	12, 333	48, 795	------------	71, 273
Man days lost account strike	151, 243	86, 429	905, 958	------------	1, 143, 630
Average days lost:					
Per man employed	7	2	10	------------	7
Per man on strike	15	7	19	------------	16
1925					
Total number employed	19, 579	50, 745	89, 399	589	160, 312
Men on strike	18, 751	45, 715	82, 876	586	147, 928
Man days lost account strike	1, 863, 605	4, 675, 143	8, 661, 264	69, 494	15, 269, 506
Average days lost:					
Per man employed	95	92	97	118	95
Per man on strike	99	102	105	119	103
1926					
Total number employed	20, 133	50, 138	94, 469	646	165, 386
Men on strike	17, 074	44, 309	83, 381	612	145, 376
Man days lost account strike	723, 550	1, 825, 482	3, 415, 913	25, 532	5, 990, 477
Average days lost:					
Per man employed	36	36	36	40	36
Per man on strike	42	41	41	42	41
1927					
Total number employed	20, 253	50, 313	94, 069	624	165, 259
Men on strike	5, 073	2, 991	12, 414	------------	20, 478
Man days lost account strike	20, 112	5, 771	133, 359	------------	159, 242
Average days lost:					
Per man employed	1	(1)	1	------------	1
Per man on strike	4	2	11	------------	8

[1] Less than one-half day.

METHODS OF MINING

Natural conditions in the anthracite mines have not favored the introduction of cutting machines, and out of 67,688,369 tons of fresh-mined coal produced in 1927 only 1,046,329 tons, or 1.5 per cent, was cut by machine. (Table 24A.) The output mechanically cut was obtained with 138 mining machines, of which 121 were at work in the Wyoming region and 15 in Sullivan County. The use of cutting machines is almost entirely confined to these two regions where the beds are less steeply inclined.

TABLE 24A.—*Anthracite mined by machines, 1925–1927*

Region	1925		1926		1927	
	Number of machines	Gross tons	Number of machines	Gross tons	Number of machines	Gross tons
Lehigh	------------	------------	------------	------------	1	(1)
Schuylkill	1	19, 063	2	4, 032	1	(1)
Wyoming	139	764, 204	74	732, 897	121	[1] 983, 829
Sullivan County	19	57, 080	14	94, 254	15	62, 500
	159	840, 347	90	831, 183	138	1, 046, 329

[1] Lehigh and Schuylkill included with Wyoming.

Strip mining is carried on in all of the three major regions and is most important in the Lehigh and Schuylkill areas. In 1927 the number of steam and electric shovels in use was 112 and the output was 1,922,461 tons, over half of which was produced in the Lehigh region. (Table 25A.)

TABLE 25A.—*Anthracite recovered from steam-shovel strip pits, 1925–1927*

Region	1925		1926		1927	
	Number of shovels	Gross tons	Number of shovels	Gross tons	Number of shovels	Gross tons
Lehigh	52	831, 181	43	1, 072, 392	41	967, 210
Schuylkill	38	546, 678	40	818, 443	45	745, 696
Wyoming	7	31, 496	16	253, 233	26	209, 555
	97	1, 409, 355	99	2, 144, 068	112	1, 922, 461

DREDGE OPERATIONS

The three rivers draining the anthracite fields—the Susquehanna, Schuylkill, and Lehigh—have been carrying away thousands of tons of combustible material annually for almost a century. The resulting deposits of coal in these streams have been a fruitful source for coal-dredging operations. Most of the dredge coal is recovered from the Susquehanna and its tributaries—Wiconisco, Mahanoy, Shamokin, and Swatara Creeks. The Schuylkill River is second in importance, and a small amount is also taken from the Lehigh River. In most of the tables of this report the output of the dredges has been apportioned among the Schuylkill, Lehigh, and Wyoming regions, but this apportionment is necessarily arbitrary, for most of the dredges are working some distance downstream from the mines. The recapitulation, by rivers, in Table 26A will indicate more clearly where the dredge coal is recovered.

In 1927, 45 dredges reported to the Bureau of Mines a production of 867,694 tons, valued at $794,807. This represents an increase in tonnage but a decline in total value in comparison with 1926. Definite reports were received from all dredge operators on its lists, but the bureau can not guarantee that its present lists are complete because a systematic field canvass of the dredge industry has not been made since 1920, although meanwhile the names of certain new operations have been obtained.

The "river coal" consists chiefly of sizes equivalent to buckwheat No. 3 and boiler. A typical average size analysis at Harrisburg is as follows:[42]

Through (round mesh) (inches)	Over (round mesh) (inches)	Per cent
$\frac{1}{16}$	------------	25. 00
$\frac{3}{32}$	$\frac{1}{16}$	42. 65
$\frac{3}{16}$	$\frac{3}{32}$	25. 85
------------	$\frac{3}{16}$	6. 5

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[42] Sisler, J. D., Fraser, T., and Ashmead, D. C., Anthracite Culm and Silt (A Cooperative Study Between the Pennsylvania Topographic and Geologic Survey, the Pennsylvania Water and Power Resources Board, and the United States Bureau of Mines): Pennsylvania Topog. and Geol. Survey Bull. M 12, 1928, p. 180.

Much of the dredge coal is sold for steam raising at near-by points, and in recent years it has been quite popular as a domestic fuel in Harrisburg, York, Sunbury, and other cities, for which purpose it is burned under forced draft on a wire screen or perforated plate. Of the total production, 368,461 tons were sold locally and 494,653 tons shipped away. (Table 4A.) In comparison with 1926, shipments of "river" coal increased 139,706 tons. Only 4,580 tons were consumed as fuel by the dredge operators themselves, since many of the dredges are supplied with power by internal-combustion engines.

Prices obtained for dredge coal have declined since 1920 and have averaged slightly less than $1 per gross ton in the last five years. The average of 92 cents per gross ton in 1927 was the lowest in recent years. The average receipts per ton on all coal sold, including local sales as well as shipments, have been as follows:

1920	$1.30	1924	$0.94
1921	1.17	1925	1.02
1922	1.23	1926	1.01
1923	.95	1927	.92

In the winter dredging is handicapped by cold weather. The seasonal nature of the industry is shown by Table 27A, which gives the number of employees in each month.

TABLE 26A.—*Anthracite produced by dredges, by rivers, 1926 and 1927*

River (including tributaries)	Number of dredges	Gross tons	Value	River (including tributaries)	Number of dredges	Gross tons	Value
1926				1927			
Lehigh	1	52,272	$61,743	Lehigh	2	76.051	$89,592
Schuylkill	10	117,548	153,127	Schuylkill	9	114,022	106,758
Susquehanna	38	646,934	613,528	Susquehanna	34	677,621	598,457
	49	816,754	828,398		45	867,694	794,807

TABLE 27A.—*Number of employees on pay rolls of anthracite-dredge operations on the 1st day of each month, 1925–1927*

Month	1925	1926	1927	Month	1925	1926	1927
January	114	182	107	July	376	435	363
February	125	191	132	August	367	419	362
March	234	248	174	September	384	399	327
April	325	344	285	October	394	389	319
May	356	412	334	November	352	336	266
June	368	441	354	December	247	250	160

PETROLEUM

By G. R. Hopkins and A. B. Coons [1]

SUMMARY

The production of crude petroleum in the United States in 1927 amounted to 901,129,000 barrels, a new high figure and an increase over 1926 of 130,255,000 barrels, or 17 per cent. Because of the exceptionally high productive area opened up in Seminole County, Okla., during the closing months of 1926, a new record output was anticipated in 1927 but not until mid year was it expected to approach the 900,000,000-barrel mark. Possibly the rapid increase in output during the early months of 1927 was due to the gas lift, an engineering process that enabled the Seminole producers to convert wells that otherwise would have been medium-size pumpers into large flowing wells. Of the total 1927 output 897,343,000 barrels represents oil transported from producing properties (except in California the basis of production in the monthly reports of the Bureau of Mines), 2,154,000 barrels represents oil used as fuel on the leases on which produced, and the remainder, 1,632,000 barrels, represents the net gain in producers' stocks (stocks at wells) during the year. Of the total production 788,794,000 barrels, or 88 per cent, was classed as light oil and 112,335,000 barrels, or 12 per cent, as heavy oil, indicating an increase over 1926 in the proportion of light oil. This increase was due mainly to the heavy output of high-gravity oil at Seminole as contrasted with a continued decline at Smackover, a heavy-oil field, and to the shutting-in of many wells in the heavy-oil fields of California.

The Mid-Continent field or district contributed the major part of the increased production in 1927, producing 61 per cent of the total output as compared with 55 per cent in 1926. Declines in production in the Central and Rocky Mountain States were more than counterbalanced by gains in the Appalachian and Gulf coast districts and in California.

As far as individual fields are concerned, the development of the pools in the greater Seminole district of Oklahoma overshadowed all others. The production of this district in 1927 amounted to nearly 136,000,000 barrels, as compared with 11,000,000 barrels in 1926. This exceptional increase was the chief factor in the gain in national output and allowed Oklahoma to regain first rank among the producing States for the first time since 1922. The area of next greatest importance was west Texas, in which Crane, Upton, Pecos, and Winkler are the most important producing counties. The most remarkable pool in this district with respect to large initial production at shallow depths was the Yates pool in Pecos and Crockett. As potential producers the pools of west Texas far surpass those in the Seminole district, but, because of such factors as distance from consuming centers, high sulphur content of the oil, and restrictive agreements among operators, exerted little effect on general market conditions during 1927. Wildcatting and development work in other areas were at a low ebb in 1927 because of depressed prices. A number of new fields were discovered, some of the most important of which were as follows: Champagnolle, Ark.; Rincon, Round Mountain, Potrero, and Goleta, Calif.; Oxford, Kans.; Boggy Creek and Waddell, Tex.; Oregon Basin, Wyo. The search for new salt domes in the Gulf coast area by geophysical prospecting was continued in 1927, with the result that a number of new discoveries were made. Only a few of these, however, were proved for oil and actively exploited, as most of them were controlled by a few large companies that preferred to treat them as a reserve for the future. Although the low prices that prevailed in 1927 were particularly severe on the operators in the eastern and central fields, the total production of the nine States involved (see p. 545) increased for the third successive year, primarily because of continued success in water flooding in the Bradford district of Pennsylvania and New York and because of greater efficiency in operation over the entire area. Production in the majority of the fields in the Rocky Mountain district declined during the year, and few discoveries were made. The discovery of prolific production on the Oregon Basin structure stimulated interest, but the heavy asphaltic character of the oil held back development work.

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[1] The tables in this report were prepared, unless otherwise indicated, by Misses A. B. Coons, M. N. Schellenger, and A. L. Clapp, and Mrs. C. S. Evans, of the Bureau of Mines. Figures on imports and exports were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Imports of crude petroleum declined slightly from 1926; the decrease in imports of Mexican oil was nearly compensated by increased receipts of oil from Venezuela and Colombia. Exports of crude petroleum in 1927 showed no material change from the previous year. With an abundance of crude petroleum available in the Mid-Continent field and in Venezuela, the demand for California crude by the eastern refineries was reduced, and in consequence domestic shipments of crude eastward through the Panama Canal decreased.

The status of crude stocks east of California in 1927 was the reverse of 1926. During 1926 stocks of crude were materially reduced, but once the development at Seminole was well under way in the early part of 1927 stocks rapidly increased. The increase in total crude stocks east of California was slightly more than 75,000,000 barrels, the major part of which was in tank-farm stocks in the Mid-Continent field. In California the situation with regard to crude stocks was promising. Although stocks of light or refinable crude in the State declined during the year from 30,861,000 to 20,086,000 barrels, or more than one-third, stocks of heavy crude and fuel oil increased over 5,000,000 barrels, a figure which would have been considerably higher except for the cooperation shown by the large companies in shutting in some of their heavy-oil wells.

The consumption of crude petroleum in the United States in 1927, as measured by runs to stills at refineries, totaled 828,835,000 barrels, a new high figure, representing an increase of 49,571,000 barrels, or 6 per cent, over 1926. Of the total 50,106,000 barrels, or 6 per cent, was foreign crude petroleum. The domestic consumption of all oils in 1927 amounted to 804,578,000 barrels, a gain of only 3 per cent over 1926. This small gain in the face of a 13 per cent gain in the indicated domestic demand for gasoline may be accounted for in large part by a decrease in the indicated domestic demand for the other refined products.

The overproduction of crude petroleum in the latter part of 1926 and during 1927 resulted in a general reduction in posted prices. This decline had a material effect on total value at wells, which was 19 per cent lower than in 1926, in spite of the fact that the total quantity produced in 1927 was 17 per cent higher. The total value in 1927 was $1,172,830,000, an average of $1.30 per barrel, or a decline of $0.58, or 31 per cent, from 1926. Price movements were similar in 1927 for nearly all grades of crude petroleum east of California; the highest price was recorded at the beginning of the year, followed by several reductions in the period February to April, with no change thereafter. Only one price change was recorded in California during the year. This change occurred on April 1, and for some of the grades averaged 50 per cent of the price on January 1.

From the official beginning of the industry in 1859 to 1927 more than 740,000 wells were drilled for oil and gas in the United States, of which nearly 152,000, or 20 per cent, were dry holes. The drastic cuts in crude prices in 1927 severely curtailed drilling, except in flush fields, and the number of completions fell from 29,319 in 1926 to 24,143 in 1927. Of the wells completed in 1927, 14,442, or 60 per cent, were oil wells; 2,491, or 10 per cent, were gas wells, and the remainder, 7,210, or 30 per cent, were dry holes, indicating an increase in the percentage of both dry holes and gas wells. The percentage of dry holes (30) is the largest recorded for any year beginning with 1908, and, though the record is obscure, probably for all previous years. The majority of the producing fields registered a decrease in the number of completions, the most notable exceptions being Seminole of Oklahoma, the Bradford district of New York and Pennsylvania, west Texas, and Huntington Beach, Kern River, and Seal Beach fields of California. The average production per well per day in 1927 increased from 6.8 barrels in 1926 to 7.7 barrels, mainly because of operations in the Seminole district of Oklahoma.

Condensed summary of statistics of crude petroleum, 1923–1927

	1923	1924	1925	1926	1927
Domestic production..........thousands of barrels [1]..	732. 407	713, 940	763, 743	770, 874	901, 129
Imports..........do....	82, 015	77, 775	61, 824	60, 382	58, 383
	814, 422	791, 715	825, 567	831, 256	959, 512
Indicated domestic demand..........do....	[2] 714, 862	[2] 748, 462	[3] 726, 434	[3] 779, 881	[3] 804, 578
Exports (including foreign crude oil)..........do....	17, 385	17, 973	13, 335	15, 407	15, 844
Added to stocks [4]..........do....	82, 175	25, 280	30, 120	[5] 24, 764	68, 471
	814, 422	791, 715	([6])	([6])	([6])
Runs to refinery stills..........do....	581, 238	643, 719	739, 920	779, 264	828, 835
World production..........do....	1, 015, 735	1, 014, 318	1, 068, 953	1, 096, 887	1, 261, 073
United States percentage of world production..........	72	70	71	70	71
Total value of domestic production at wells..........thousands of dollars..	978, 430	1, 022, 683	1, 284, 960	1, 447, 760	1, 172, 830
Average price per barrel at wells..........	$1. 34	$1. 43	$1. 68	$1. 88	$1. 30
Total number of producing oil wells in the United States, Dec. 31..........	290, 100	299, 100	306, 100	318, 600	323, 300
Total number of oil wells completed in the United States during year..........	16, 206	14, 587	16, 559	19, 013	14, 442

[1] 42 United States gallons.

[2] Indicated domestic demand for crude petroleum.

[3] Indicated domestic demand for all oils, that is, for crude petroleum, petroleum products, natural gasoline, and benzol.

[4] 1923–24: Producers', pipe-line, tank-farm, and refinery stocks of domestic and foreign petroleum (topped oil topped in Mexico not included in 1924); 1925–27: All refined products and natural gasoline included.

[5] Decrease.

[6] Figures not available.

Summary of supply and demand of all oils (including wax, coke, and asphalt), 1926–27, by months

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year
1926													
New supply:													
Domestic production—													
Crude petroleum—													
Light	49,039	44,892	50,027	49,562	51,710	51,068	53,501	54,558	54,007	57,422	57,720	60,220	633,726
Heavy	10,942	10,000	10,853	10,809	11,112	10,721	11,667	12,451	11,775	12,242	12,171	12,405	137,148
Total crude	59,981	54,892	60,880	60,371	62,822	61,789	65,168	67,009	65,782	69,664	69,891	72,625	770,874
Natural gasoline	2,524	2,381	2,693	2,609	2,626	2,548	2,629	2,664	2,657	2,907	2,967	3,100	32,305
Benzol	181	166	179	171	176	171	179	179	174	181	179	176	2,112
Total production	62,686	57,439	63,752	63,151	65,624	64,508	67,976	69,852	68,613	72,752	73,037	75,901	805,291
Daily average	2,022	2,051	2,057	2,105	2,117	2,150	2,193	2,253	2,287	2,347	2,435	2,448	2,206
Imports—													
Crude	4,688	3,743	7,216	5,906	4,501	5,571	5,185	5,332	4,350	3,860	5,043	4,987	60,382
Refined	1,251	2,001	1,522	1,616	2,017	2,344	1,992	2,361	1,132	1,765	1,619	1,318	20,938
Total new supply, all oils	68,625	63,183	72,490	70,673	72,142	72,423	75,153	77,545	74,095	78,377	79,699	82,206	886,611
Daily average	2,214	2,257	2,338	2,356	2,327	2,414	2,424	2,501	2,470	2,528	2,657	2,652	2,429
Change in stocks, all oils	[1] 1,237	217	1,711	[1] [2]11,003	[1] 2,594	[1] 4,782	[1] 2,667	[1] 5,885	[1] 3,004	5	921	3,554	[1] 24,764
Demand:													
Total demand	69,862	62,966	70,779	81,676	74,736	77,205	77,820	83,430	77,099	78,372	78,778	78,652	911,375
Daily average	2,254	2,249	2,283	2,723	2,411	2,574	2,510	2,691	2,570	2,528	2,626	2,537	2,497
Exports [3]—													
Crude	1,183	1,049	965	1,308	1,842	1,226	1,726	1,083	1,388	1,010	1,344	1,283	15,407
Refined	9,742	8,999	8,276	10,688	9,816	9,960	8,762	10,709	9,306	7,630	11,964	10,235	116,087
Domestic demand	58,937	52,918	61,538	69,680	63,078	66,019	67,332	71,638	66,405	69,732	65,470	67,134	779,881
Daily average	1,901	1,890	1,985	2,323	2,035	2,201	2,172	2,311	2,214	2,249	2,182	2,166	2,137
Excess of daily average domestic production over domestic demand	121	161	72	[4] 218	82	[4] 51	21	[4] 58	73	98	253	282	69
Stocks (end of month):													
Crude petroleum—													
East of California [5]—													
Light	291,628	230,730	228,161	226,737	224,669	221,665	221,535	220,240	220,103	222,137	223,828	225,404	--------
Heavy		58,186	60,030	59,673	59,517	59,402	57,137	57,719	57,885	55,310	53,321	52,860	--------
California													
Light	44,197	44,871	43,973	[2] 38,634	37,192	35,454	33,548	32,149	30,494	30,390	30,051	30,861	--------
Heavy [6]	86,614	86,744	88,466	[2] 85,656	88,184	87,364	88,092	87,772	87,353	87,529	87,440	87,270 [7] 88,309	-------- --------
Total crude	422,439	420,531	420,630	[2] 410,700	409,562	403,885	400,312	397,880	395,835	395,366	394,640	396,395 [7] 397,434	-------- --------

Natural gasoline at plants	405	419	490	507	588	650	631	590	493	488	462	455	--------
Refined products	120, 780	122, 891	124, 432	[2]123, 342	121, 805	122, 638	123, 563	120, 151	119, 289	119, 768	121, 441	123, 247	--------
Grand total stocks, all oils	543, 624	543, 841	545, 552	[2]534, 549	531, 955	527, 173	524, 506	518, 621	515, 617	515, 622	516, 543	{520,097 {[7]521,136	-------- --------
Day's supply[8]	241	242	239	196	221	205	209	193	201	204	197	205	208
Bunker oil (included above in domestic demand)	3, 746	3, 232	3, 402	4, 060	3, 729	4, 038	3, 940	4, 126	4, 040	4, 330	3, 953	4, 066	46, 662
1927													
New supply:													
Domestic production—													
Crude petroleum—													
Light	61, 564	59, 061	65, 494	63, 565	67, 283	65, 862	69, 121	69, 345	66, 911	68, 277	65, 884	66, 427	788, 794
Heavy	10, 194	9, 061	10, 020	9, 567	9, 562	9, 441	9, 659	9, 443	8, 998	9, 257	8, 609	8, 524	112, 335
Total crude	71, 758	68, 122	75, 514	73, 132	76, 845	75, 303	78, 780	78, 788	75, 909	77, 534	74, 493	74, 951	901, 129
Natural gasoline	3, 145	2, 933	3, 272	3, 172	3, 219	3, 093	3, 119	3, 214	3, 245	3, 419	3, 393	3, 433	38, 657
Benzol	217	200	226	216	221	210	214	214	210	217	205	212	2, 562
Total production	75, 120	71, 255	79, 012	76, 520	80, 285	78, 606	82, 113	82, 216	79, 364	81, 170	78, 091	78, 596	942, 348
Daily average	2, 423	2, 545	2, 549	2, 551	2, 590	2, 620	2, 649	2, 652	2, 645	2, 618	2, 603	2, 535	2, 582
Imports—													
Crude	4, 593	4, 181	4, 582	4. 063	4, 557	4, 019	4, 823	6, 261	5, 122	4, 633	5, 339	6, 210	58, 383
Refined	1, 189	1, 507	1, 027	1, 201	1, 329	1, 448	1, 053	774	868	1, 042	1, 159	756	13, 353
Total new supply, all oils	80, 902	76, 943	84, 621	81, 784	86, 171	84, 073	87, 989	89, 251	85, 354	86, 845	84, 589	85, 562	1,014,084
Daily average	2, 610	2, 748	2, 730	2, 726	2, 780	2, 802	2, 838	2, 879	2, 845	2, 801	2, 820	2, 760	2, 778
Change in stocks, all oils	8, 249	9, 006	8, 451	8, 015	5, 848	4, 331	7, 758	1, 614	1, 520	3, 442	7, 110	3, 127	68, 471
Demand:													
Total demand	72, 653	67, 937	76, 170	73, 769	80, 323	79, 742	80, 231	87, 637	83, 834	83, 403	77, 479	82, 435	945, 613
Daily average	2, 344	2, 426	2, 457	2, 459	2, 591	2, 658	2, 588	2, 827	2, 794	2, 690	2, 583	2, 659	2, 591
Exports[3]—													
Crude	1, 204	1, 165	1, 199	1, 171	1, 390	1, 411	1, 089	1, 382	1, 297	1, 539	1, 280	1, 717	15, 844
Refined	10, 051	9, 636	9, 450	9, 940	11, 868	11, 311	10, 080	11, 758	9, 652	11, 554	10, 525	9, 366	125, 191
Domestic demand	61, 398	57, 136	65, 521	62, 658	67, 065	67, 020	69, 062	74, 497	72, 885	70, 310	65, 674	71, 352	804, 578
Daily average	1, 980	2, 041	2, 114	2, 089	2, 163	2, 234	2, 228	2, 403	2, 430	2, 268	2, 189	2, 302	2, 204
Excess of daily average domestic production over domestic demand	443	504	435	462	427	386	421	249	215	350	414	233	378

[1] Decrease.
[2] Fire loss 4,600,000 barrels light crude, 3,204,000 barrels heavy crude, and 410,000 barrels various refined products—total 8,214,000 barrels.
[3] Includes shipments to noncontiguous Territories.
[4] Deficiency.
[5] Exclusive of producers' stocks.
[6] Includes fuel oil.
[7] Revised for comparison with 1927.
[8] Grand total stocks, all oils, divided by daily average total demand.

Summary of supply and demand of all oils (including wax, coke, and asphalt), 1926–27, by months—Continued

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year
1927—Continued													
Stocks (end of month):													
Crude petroleum—													
East of California[5]—													
Light	230, 976	238, 529	245, 405	252, 584	259, 020	267, 610	276, 871	286, 803	290, 851	297, 336	301, 325	303, 539	--------
Heavy	48, 326	47, 737	45, 737	46, 235	47, 947	47, 854	47, 507	46, 610	48, 621	48, 528	49, 162	48, 499	--------
California—													
Light	31, 017	29, 770	29, 568	29, 460	27, 143	26, 898	25, 301	23, 262	22, 826	21, 676	21, 273	20, 086	--------
Heavy[6]	89, 043	88, 834	89, 103	89, 537	91, 407	91, 964	93, 011	93, 353	93, 820	92, 233	93, 880	93, 719	--------
Total crude	399, 362	404, 870	409, 813	417, 816	425, 517	434, 326	442, 690	450, 028	456, 118	459, 773	465, 640	465, 843	--------
Natural gasoline at plants	560	619	697	788	926	971	992	846	736	781	820	734	--------
Refined products	129, 463	132, 902	136, 332	136, 253	134, 262	129, 739	129, 112	123, 534	119, 074	118, 816	120, 020	123, 030	--------
Grand total stocks, all oils	529, 385	538, 391	546, 842	554, 857	560, 705	565, 036	572, 794	574, 408	575, 928	579, 370	586, 480	589, 607	--------
Day's supply[8]	226	222	223	226	216	213	221	203	206	215	227	222	228
Bunker oil (included above in domestic demand)	3, 940	3, 587	3, 874	4, 204	4, 251	4, 244	4, 077	4, 470	4, 436	4, 594	4, 110	4, 264	50, 051

[5] Exclusive of producers' stocks.

[6] Includes fuel oil.

[8] Grand total stocks, all oils, divided by daily average total demand.

PRODUCTION

DOMESTIC PRODUCTION

BY MONTHS

The peak months for production of crude petroleum in 1927 were July and August, during which 78,780,000 and 78,788,000 barrels, respectively, were produced. The latter represents a daily average of 2,542,000 barrels, the highest ever recorded for any month. Daily average production declined steadily during the last four months of the year, but that for December, 2,418,000 barrels, was 3 per cent more than that for December, 1926.

Petroleum produced in the United States, 1923–1927, by months, in thousands of barrels

Year	January	February	March	April	May	June	July	August	September	October	November	December	The year
1923	52,527	48,588	56,969	59,008	62,377	62,845	65,925	66,422	65,306	67.506	65,388	59,546	732,407
1924	57,273	55,889	60,141	59,830	61,834	59,583	61,932	62,398	60,376	60,469	56,782	57,433	713.940
1925	60,400	54,775	61,339	62,048	68.850	67,240	67,763	67,580	65,432	64,842	61,927	61,547	763,743
1926	59,981	54,892	60,880	60,371	62,822	61,789	65,168	67,009	65,782	69,664	69,891	72,625	770,874
1927	71,758	68,122	75,514	73,132	76,845	75,303	78,780	78,788	75,909	77,534	74,493	74,951	901,129

BY FIELDS OR DISTRICTS

The Mid-Continent field, or more specifically the Seminole district of Oklahoma, contributed the major part of the increased production in 1927. Declines in production in the Central and Rocky Mountain States were more than counterbalanced by gains in California and in the Gulf coast district. The Mid-Continent field produced 61 per cent of the total output in 1927, as compared with 55 per cent in 1926.

Petroleum produced in the United States, 1926–27, by fields

[Thousands of barrels of 42 U. S. gallons]

Field	January	February	March	April	May	June	July	August
1926								
Appalachian	2,162	2,126	2,386	2,375	2,358	2,451	2,491	2,460
Lima-Indiana	157	158	179	171	176	195	183	174
Michigan	2	1	2	3	3	3	4	7
Illinois and southwestern Indiana	689	655	779	633	707	718	736	724
Mid-Continent	31,911	29,049	32,453	33,090	34,643	34,244	35,844	36,604
Gulf coast [1]	2,832	2,694	2,758	2,757	2,816	2,632	3,645	4,872
Rocky Mountain [2]	3,181	3,034	3,497	3,286	3,403	3,270	3,475	3,263
California [3]	19,047	17,175	18,826	18,056	18,716	18,276	18,790	18,905
	59,981	54,892	60,880	60,371	62,822	61,789	65,168	67,009
Daily average	1,935	1,960	1,964	2,012	2,027	2,060	2,102	2,162
1927								
Appalachian	2,330	2,318	2,675	2,539	2,612	2,604	2,547	2,692
Lima-Indiana	140	156	170	156	161	171	156	159
Michigan	29	29	38	40	40	42	38	41
Illinois and southwestern Indiana	644	617	753	589	660	662	636	673
Mid-Continent	40,942	40,362	44,748	43,215	46,610	45,646	48,950	49,142
Gulf coast [1]	4,831	4,200	4,580	4,367	4,524	4,427	4,301	4 230
Rocky Mountain [2]	2,650	2,450	2,706	2,725	2,724	2,563	2,766	2.504
California [3]	20,192	17,990	19,844	19,501	19,514	19,188	19,386	19,347
	71,758	68,122	75,514	73,132	76,845	75,303	78,780	78,788
Daily average	2,315	2,433	2,436	2,438	2,479	2,510	2,541	2,542

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[1] Salt-dome pools.

[2] Includes Alaska.

[3] Annual and semiannual figures from Division of Mines and Mining, Department of Natural Resources, California. Monthly figures prorated on basis of monthly reports by the American Petroleum Institute.

Petroleum produced in the United States, 1926–27, by fields—Continued

[Thousands of barrels of 42 U. S. gallons]

Field	September	October	November	December	The year		
					Quantity	Value at wells	
						Total (thousands of dollars)	Average per barrel
1926							
Appalachian	2,450	2,485	2,381	2,447	28,572	89,820	$3.14
Lima-Indiana	169	166	146	156	2,030	4,710	2.32
Michigan	8	15	20	26	94	253	2.69
Illinois and southwestern Indiana	711	704	672	690	8,418	18,660	2.22
Mid-Continent	36,207	39,351	39,536	40,935	423,867	851,600	2.01
Gulf coast [1]	4,911	4,896	5,088	5,374	45,275	67,600	1.49
Rocky Mountain [2]	3,108	3,027	2,799	2,602	37,945	69,570	1.83
California [3]	18,218	19,020	19,249	20,395	224,673	345,547	1.54
	65,782	69,664	69,891	72,625	770,874	1,447,760	1.88
Daily average	2,193	2,247	2,330	2,343	2,112		
1927							
Appalachian	2,586	2,592	2,529	2,430	30,454	76,880	2.52
Lima-Indiana	153	153	131	129	1,835	3,260	1.78
Michigan	38	38	33	33	439	832	1.90
Illinois and southwestern Indiana	640	623	626	597	7,720	12,900	1.67
Mid-Continent	46,907	48,051	46,295	46,119	546,987	708,940	1.30
Gulf coast [1]	4,155	4,257	4,013	4,184	52,069	67,250	1.29
Rocky Mountain [2]	2,299	2,303	2,285	2,454	30,429	42,033	1.38
California [3]	19,131	19,517	18,581	19,005	231,196	260,735	1.13
	75,909	77,534	74,493	74,951	901,129	1,172,830	1.30
Daily average	2,530	2,501	2,483	2,418	2,469		

[1] Salt-dome pools.

[2] Includes Alaska.

[3] Annual and semiannual figures from Division of Mines and Mining, Department of Natural Resources, California. Monthly figures prorated on basis of monthly reports by the American Petroleum Institute.

BY STATES

Several of the petroleum-producing States changed rank in 1927—Oklahoma displaced California in first place, Kansas displaced Arkansas in fourth place, Louisiana displaced Wyoming in sixth place, and Ohio moved from eleventh place in 1926 to ninth in 1927, passing both Illinois and Montana.

Petroleum produced in the United

[Thousands of barrels

Year	New York	Pennsylvania	Ohio	West Virginia	California	Kentucky	Tennessee	Colorado	Indiana	Illinois	Kansas
1859-1875	(2)	[2]74,072	------	------	------	------	------	------	------	------	------
1876	(2)	[2]8,969	32	120	12	------	------	------	------	------	------
1877	(2)	[2]13,135	30	172	13	------	------	------	------	------	------
1878	(2)	[2]15,164	38	180	15	------	------	------	------	------	------
1879	(2)	[2]19,685	29	180	20	------	------	------	------	------	------
1880	(2)	[2]26,028	39	179	40	------	------	------	------	------	------
1881	(2)	[2]27,376	34	151	100	------	------	------	------	------	------
1882	6,685	23,368	40	128	129	------	------	------	------	------	------
1883	4,004	19,125	47	126	143	[3]5	(3)	------	------	------	------
1884	3,231	20,541	90	90	262	[3]4	(3)	------	------	------	------
1885	2,658	18,118	662	91	325	[3]5	(3)	------	------	------	------
1886	2,151	23,647	1,783	102	377	[3]5	(3)	------	------	------	------
1887	2,075	20,281	5,023	145	678	[3]5	(3)	76	------	------	------
1888	(2)	[2]16,489	10,011	119	690	[3]5	(3)	298	------	------	------
1889	1,897	19,591	12,472	544	303	[3]5	(3)	317	33	1	1
1890	(2)	[2]28,458	16,125	493	307	[3]6	(3)	369	64	1	1
1891	1,585	31,424	17,740	2,406	324	[3]9	(3)	666	137	1	1
1892	1,273	27,149	16,363	3,810	385	[3]7	(3)	824	698	1	5
1893	1,032	19,283	16,249	8,446	470	[3]3	(3)	594	2,335	1	18
1894	942	18,078	16,792	8,577	706	[3]2	(3)	516	3,689	(4)	40
1895	913	18,231	19,545	8,120	1,209	[3]2	(3)	438	4,386	(4)	44
1896	1,205	19,379	23,941	10,020	1,253	[3]2	(3)	361	4,681	(4)	114
1897	1,279	17,983	21,561	13,090	1,903	(3 4)	(3)	385	4,122	1	81
1898	1,205	14,743	18,739	13,615	2,257	[3]6	(3)	444	3,731	(4)	72
1899	1,321	13,054	21,142	13,911	2,642	[3]18	(3)	390	3,848	(4)	70
1900	1,301	13,258	22,363	16,196	4,325	[3]62	(3)	317	4,874	(4)	75
1901	1,207	12,625	21,648	14,177	8,787	[3]137	(3)	461	5,757	(4	179
1902	1,120	12,064	21,014	13,513	13,984	[3]185	(3)	397	7,481	(4)	332
1903	1,163	11,355	20,480	12,900	24,382	[3]554	(3)	484	9,186	------	932
1904	1,113	11,126	18,877	12,645	29,649	[3]998	(3)	501	11,339	------	4,251
1905	1,118	10,437	16,347	11,578	33,428	[3]1,217	(3)	376	10,964	181	[6]12,014
1906	1,243	10,257	14,788	10,121	33,099	[3]1,214	(3)	328	7,674	4,397	[6]21,718
1907	1,212	10,000	12,207	9,095	39,748	[3]821	(3)	332	5,128	24,282	2,410
1908	1,160	9,424	10,859	9,523	44,855	728	------	380	3,283	33,686	1,801
1909	1,135	9,299	10,633	10,745	55,472	639	------	311	2,296	30,898	1,264
1910	1,054	8,795	9,916	11,753	73,011	469	------	240	2,160	33,143	1,128
1911	953	8,248	8,817	9,796	81,134	472	------	227	1,695	31,317	1,279
1912	874	7,838	8,969	12,129	87,269	484	------	206	970	28,602	1,593
1913	948	7,917	8,781	11,567	97,788	525	------	189	956	23,894	2,375
1914	939	8,170	8,536	9,680	99,775	503	------	223	1,336	21,920	3,104
1915	888	7,838	7,825	9,265	86,592	437	------	208	876	19,042	2,823
1916	874	7,593	7,744	8,731	90,952	1,202	1	197	769	17,714	8,738
1917	880	7,733	7,751	8,379	93,878	3,088	12	121	760	15,777	36,536
1918	809	7,408	7,285	7,867	97,532	4,368	8	143	878	13,366	45,451
1919	851	8,137	7,736	8,327	101,183	9,278	15	121	972	11,960	33,048
1920	906	7,438	7,400	8,249	103,377	8,738	14	111	945	10,774	39,005
1921	988	7,418	7,335	7,822	112,600	9,013	12	108	1,158	10,043	36,456
1922	1,000	7,425	6,781	7,021	138,468	8,973	10	97	1,087	9,383	31,766
1923	1,250	7,609	7,085	6,358	262,876	8,069	8	86	1,043	8,707	28,250
1924	1,440	7,486	6,811	5,920	228,933	7,407	10	445	935	8,081	28,836
1925	1,695	8,097	7,212	5,763	232,492	6,759	24	1,226	829	7,863	38,357
1926	1,956	8,961	7,272	5,946	224,673	6,274	43	2,768	808	7,760	41,498
1927	2,242	9,526	7,593	6,023	231,196	6,719	60	2,831	852	6,994	41,069
	[7]65,775	[7]806,853	528,592	355,904	2,746,021	89,422	217	19,112	114,735	379,790	466,735
Percentage of total production	0.6	7.8	5.1	3.4	26.6	0.9	------	0.2	1.1	3.7	4.5

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[1] 1889-1899, Missouri; 1900-1906, Michigan and Missouri; 1907-1911, Michigan, Missouri, and Utah; 1912, 1917, 1918, Alaska and Michigan; 1913 and 1919, Alaska, Michigan, Missouri, and New Mexico; 1914-1916, Alaska, Michigan, and Missouri; 1920, Alaska, Arkansas, Missouri, New Mexico, and Utah; 1921-1923, Alaska, Missouri, and New Mexico; 1924-1927, Alaska and Utah.

[2] New York included with Pennsylvania.

[3] Tennessee included with Kentucky.

States, 1859–1927, by States

of 42 U. S. gallons]

Texas	Oklahoma	Wyoming	Michigan	Louisiana	New Mexico	Montana	Arkansas	Other[1]	Total		
									Quantity	Value at wells	
										Total (thousands of dollars)	Average per barrel
--------	--------	--------	--------	--------	--------	--------	--------	--------	74, 072	215, 781	$2. 91
--------	--------	--------	--------	--------	--------	--------	--------	--------	9, 133	22, 983	2. 52
--------	--------	--------	--------	--------	--------	--------	--------	--------	13, 350	31, 789	2. 38
--------	--------	--------	--------	--------	--------	--------	--------	--------	15, 397	18, 045	1. 17
--------	--------	--------	--------	--------	--------	--------	--------	--------	19, 914	17, 211	. 86
--------	--------	--------	--------	--------	--------	--------	--------	--------	26, 286	24, 601	. 94
--------	--------	--------	--------	--------	--------	--------	--------	--------	27, 661	25, 448	. 92
--------	--------	--------	--------	--------	--------	--------	--------	--------	30, 350	23, 631	. 78
--------	--------	--------	--------	--------	--------	--------	--------	--------	23, 450	25, 790	1. 10
--------	--------	--------	--------	--------	--------	--------	--------	--------	24, 218	20, 596	. 85
--------	--------	--------	--------	--------	--------	--------	--------	--------	21, 859	19, 198	. 88
--------	--------	--------	--------	--------	--------	--------	--------	--------	28, 065	19, 996	. 71
--------	--------	--------	--------	--------	--------	--------	--------	--------	28, 283	18, 877	. 67
--------	--------	--------	--------	--------	--------	--------	--------	--------	27, 612	17, 948	. 65
(4)	--------	--------	--------	--------	--------	--------	--------	(1 4)	35, 164	26, 963	. 77
(4)	--------	--------	--------	--------	--------	--------	--------	(1 4)	45, 824	35, 365	. 77
(4)	(4)	--------	--------	--------	--------	--------	--------	(1 4)	54, 293	30, 527	. 56
(4)	(4)	--------	--------	--------	--------	--------	--------	(1 4)	50, 515	25, 907	. 51
(4)	(4)	--------	--------	--------	--------	--------	--------	(1 4)	48, 431	28, 950	. 60
(4)	(4)	2	--------	--------	--------	--------	--------	(1 4)	49, 344	35, 522	. 72
(4)	(4)	4	--------	--------	--------	--------	--------	(1 4)	52, 892	57, 632	1. 09
1	(4)	3	--------	--------	--------	--------	--------	(1 4)	60, 960	58, 519	. 96
66	1	4	--------	--------	--------	--------	--------	(1 4)	60, 476	40, 874	. 68
546	--------	6	--------	--------	--------	--------	--------	(1 4)	55, 364	44, 193	. 80
669	--------	6	--------	--------	--------	--------	--------	(1 4)	57, 071	64, 604	1. 13
836	6	6	(5)	--------	--------	--------	--------	2	63, 621	75, 989	1. 19
4, 394	10	5	(5)	--------	--------	--------	--------	2	69, 389	66, 417	. 96
18, 084	37	6	(5)	549	--------	--------	--------	1	88, 767	71, 179	. 80
17, 956	139	9	(5)	918	--------	--------	--------	3	100, 461	94, 694	. 94
22, 241	1, 367	12	(5)	2, 959	--------	--------	--------	3	117, 081	101, 175	. 86
28, 136	(6)	8	(5)	8, 910	--------	--------	--------	3	134, 717	84, 157	. 62
12, 568	(6)	7	(5)	9, 077	--------	--------	--------	3	126, 494	92, 445	. 73
12, 323	43, 524	9	(5)	5, 000	--------	--------	--------	4	166, 095	120, 107	. 72
11, 207	45, 799	18	(5)	5, 789	--------	--------	--------	15	178, 527	129, 079	. 72
9, 534	47, 859	20	(5)	3, 060	--------	--------	--------	6	183, 171	128, 329	. 70
8, 899	52, 029	115	(5)	6, 841	--------	--------	--------	4	209, 557	127, 900	. 61
9, 526	56, 069	187	(5)	10, 721	--------	--------	--------	8	220, 449	134, 045	. 61
11, 735	51, 427	1, 572	(5)	9, 263	--------	--------	--------	4	222, 935	164, 213	. 74
15, 010	63, 579	2, 407	(5)	12, 499	(5)	--------	--------	11	248, 446	237, 121	. 95
20, 068	73, 632	3, 560	(5)	14, 309	--------	--------	--------	8	265, 763	214, 125	. 81
24, 943	97, 915	4, 246	(5)	18, 192	--------	--------	--------	14	281, 104	179, 463	. 64
27, 645	107, 072	6, 234	(5)	15, 248	--------	45	--------	8	300, 767	330, 900	1. 10
32, 413	107, 508	8, 978	(5)	11, 392	--------	100	--------	10	335, 316	522, 635	1. 56
38, 750	103, 347	12, 596	(5)	16, 043	--------	69	--------	8	355, 928	703, 944	1. 98
79, 366	86, 911	13, 172	(5)	17, 188	(5)	90	--------	12	378, 367	760, 266	2. 01
96, 868	106, 206	16, 831	--------	35, 714	(5)	340	(5)	13	442, 929	1, 360, 745	3. 07
106, 166	114, 634	19, 333	--------	27, 103	(5)	1, 509	10, 473	12	472, 183	814, 745	1. 73
118, 684	149, 571	26, 715	--------	35, 376	(5)	2, 449	12, 712	13	557, 531	895, 111	1. 61
131, 023	160, 929	44, 785	--------	24, 919	(5)	2, 782	36, 610	18	732, 407	978, 430	1. 34
134, 522	173, 538	39, 498	--------	21, 124	98	2, 815	46, 028	13	713, 940	1, 022, 683	1. 43
144, 648	176, 768	29, 173	4	20, 272	1, 060	4, 091	77, 398	12	763, 743	1, 284, 960	1. 68
166, 916	179, 195	25, 776	94	23, 201	1, 666	7, 727	58, 332	8	770, 874	1, 447, 760	1. 88
217, 389	277, 775	21, 307	439	22, 818	1, 226	5, 058	40, 005	7	901, 129	1, 172, 830	1. 30
1, 523, 132	2, 276, 847	276, 610	[8] 537	378, 485	[9] 4, 050	27, 075	281, 558	225	10, 341, 675	14, 266, 397	-----
14. 7	22. 0	2. 7	--------	3. 7	--------	0. 3	2. 7	--------	100. 0	----------	-----

[4] Less than 500 barrels. (See Mineral Resources, 1916, pt. 2, pp. 684–685.)
[5] Included under "Other."
[6] Oklahoma included with Kansas.
[7] Early production in New York included with Pennsylvania.
[8] Figures represent 1925–1927 production only. Earlier years included under "Other."
[9] Figures represent 1924–1927 production only. Earlier years included under "Other."

Petroleum produced in the United States, 1926–27, by States

[Thousands of barrels of 42 U. S. gallons]

State	January	February	March	April	May	June	July	August	September	October	November	December	The year	Value at wells (thousands of dollars)
1926														
Arkansas	5, 409	4, 852	5, 137	5, 310	5, 335	4, 977	4, 997	4, 861	4, 611	4, 516	4, 194	4, 133	58, 332	64, 600
California [1]	19, 047	17, 175	18, 826	18, 056	18, 716	18, 276	18, 790	18, 905	18, 218	19, 020	19, 249	20, 395	224, 673	345, 547
Colorado	181	195	200	189	219	256	299	274	244	234	234	243	2, 768	5, 100
Illinois	635	600	729	579	650	662	680	670	657	651	616	631	7, 760	17, 200
Indiana:														
Southwestern	54	55	50	54	57	56	56	54	54	53	56	59	658	1, 460
Northeastern	10	13	14	13	13	14	14	14	13	12	9	11	150	310
Total Indiana	64	68	64	67	70	70	70	68	67	65	65	70	808	1, 770
Kansas	3, 199	2, 932	3, 248	3, 395	3, 522	3, 624	3, 740	3, 685	3, 498	3, 610	3, 461	3, 584	41, 498	93, 800
Kentucky	499	485	531	517	522	526	549	540	532	536	521	516	6, 274	15, 250
Louisiana:														
Gulf coast [2]	332	310	370	356	320	328	414	409	364	296	316	325	4, 140	5, 750
Northern	1, 361	1, 240	1, 522	1, 577	1, 799	1, 774	1, 705	1, 641	1, 640	1, 631	1, 555	1, 616	19, 061	32, 450
Total Louisiana	1, 693	1, 550	1, 892	1, 933	2, 119	2, 102	2, 119	2, 050	2, 004	1, 927	1, 871	1, 941	23, 201	38, 200
Michigan	2	1	2	3	3	3	4	7	8	15	20	26	94	253
Montana	379	479	776	735	779	795	914	792	648	588	475	367	7, 727	10, 170
New Mexico	133	112	128	116	159	128	134	131	157	140	160	168	1, 666	3, 270
New York	147	141	158	165	156	162	174	167	171	176	158	181	1, 956	7, 200
Ohio:														
Central and eastern	410	406	471	447	438	472	463	464	452	449	449	471	5, 392	14, 780
Northwestern	147	145	165	158	163	181	169	160	156	154	137	145	1, 880	4, 400
Total Ohio	557	551	636	605	601	653	632	624	608	603	586	616	7, 272	19, 180
Oklahoma	13, 787	12, 706	14, 345	14, 466	14, 924	14, 424	14, 793	14, 844	14, 335	15, 891	16, 829	17, 851	179, 195	413, 900
Pennsylvania	654	650	726	748	748	777	784	783	772	802	760	757	8, 961	31, 930
Tennessee	3	4	3	5	4	4	3	2	5	3	4	3	43	100
Texas:														
Gulf coast [2]	2, 500	2, 384	2, 388	2, 401	2, 496	2, 304	3, 231	4, 463	4, 547	4, 600	4, 772	5, 049	41, 135	61, 850
Rest of State	8, 155	7, 319	8, 201	8, 342	9, 063	9, 445	10, 609	11, 573	12, 123	13, 703	13, 497	13, 751	125, 781	246, 850
Total Texas	10, 655	9, 703	10, 589	10, 743	11, 559	11, 749	13, 840	16, 036	16, 670	18, 303	18, 269	18, 800	166, 916	308, 700
West Virginia	449	440	497	493	490	510	518	504	518	519	489	519	5, 946	20, 560

Wyoming	2,488	2,248	2,392	2,245	2,245	2,090	2,127	2,065	2,058	2,064	1,930	1,824	25,776	51,020
Other [3]	----------	----------	1	1	1	1	1	1	1	1	----------	----------	8	10
United States	59,981	54,892	60,880	60,371	62,822	61,789	65,168	67,009	65,782	69,664	69,891	72,625	770,874	1,447,760
Daily average	1,935	1,960	1,964	2,012	2,027	2,060	2,102	2,162	2,193	2,247	2,330	2,343	2,112	----------
1927														
Arkansas	4,042	3,540	3,825	3,284	3,465	3,313	3,303	3,242	3,081	3,175	2,912	2,823	40,005	42,400
California [1]	20,192	17,990	19,844	19,501	19,514	19,188	19,386	19,347	19,131	19,517	18,581	19,005	231,196	260,735
Colorado	237	225	248	303	246	220	245	233	211	221	222	220	2,831	3,400
Illinois	589	558	698	536	601	602	576	607	577	557	562	531	6,994	11,700
Indiana:														
Southwestern	55	59	55	53	59	60	60	66	63	66	64	66	726	1,200
Northeastern	9	12	12	12	12	13	11	10	10	9	8	8	126	190
Total Indiana	64	71	67	65	71	73	71	76	73	75	72	74	852	1,390
Kansas	3,575	3,342	3,608	3,496	3,586	3,452	3,374	3,357	3,283	3,441	3,277	3,278	41,069	58,300
Kentucky	509	490	549	540	559	558	586	612	587	588	586	555	6,719	11,220
Louisiana:														
Gulf coast [2]	322	290	447	477	453	457	458	434	414	432	419	447	5,050	6,110
Northern	1,587	1,448	1,531	1,423	1,422	1,426	1,573	1,597	1,488	1,495	1,382	1,396	17,768	23,630
Total Louisiana	1,909	1,738	1,978	1,900	1,875	1,883	2,031	2,031	1,902	1,927	1,801	1,843	22,818	29,740
Michigan	29	29	38	40	40	42	38	41	38	38	33	33	439	832
Montana	410	399	448	413	456	476	468	457	417	406	365	343	5,058	7,090
New Mexico	133	138	143	148	102	92	87	83	74	66	78	82	1,226	1,680
New York	169	169	195	185	191	189	184	200	192	189	187	192	2,242	7,110
Ohio:														
Central and eastern	454	453	536	502	527	512	487	518	492	482	473	448	5,884	11,900
Northwestern	131	144	158	144	149	158	145	149	143	144	123	121	1,709	3,070
Total Ohio	585	597	694	646	676	670	632	667	635	626	596	569	7,593	14,970
Oklahoma	18,596	19,951	22,341	21,407	23,400	23,516	26,810	26,377	24,424	24,704	23,767	22,482	277,775	397,200
Pennsylvania	718	728	842	799	812	824	789	830	805	820	793	766	9,526	29,150
Tennessee	5	4	3	4	5	4	5	9	5	6	6	4	60	90
Texas:														
Gulf coast [2]	4,509	3,910	4,133	3,890	4,071	3,970	3,843	3,796	3,741	3,825	3,594	3,737	47,019	61,140
Rest of State	13,142	12,081	13,443	13,605	14,737	13,939	13,890	14,569	14,631	15,236	14,957	16,140	170,370	187,410
Total Texas	17,651	15,991	17,576	17,495	18,808	17,909	17,733	18,365	18,372	19,061	18,551	19,877	217,389	248,550
West Virginia	475	474	550	509	518	517	496	523	505	507	484	465	6,023	17,410
Wyoming	1,870	1,688	1,867	1,860	1,919	1,774	1,965	1,730	1,596	1,609	1,620	1,809	21,307	29,830
Other [4]	----------	----------	----------	1	1	1	1	1	1	1	----------	----------	7	33
United States	71,758	68,122	75,514	73,132	76,845	75,303	78,780	78,788	75,909	77,534	74,493	74,951	901,129	1,172,830
Daily average	2,315	2,433	2,436	2,438	2,479	2,510	2,541	2,542	2,530	2,501	2,483	2,418	2,469	----------

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[1] Annual and semiannual figures from Division of Mines and Mining, Department of Natural Resources, California. Monthly figures prorated on basis of monthly reports by the American Petroleum Institute.

[2] Salt-dome pools.

[3] Alaska, 7,600 barrels, valued at $9,600, and Utah, 525 barrels, $656.

[4] Alaska and Utah.

Arkansas.—The production of crude petroleum in Arkansas continued to decline and in 1927 amounted to 40,005,000 barrels, as compared with 58,332,000 barrels in 1926, a decrease of 31 per cent. Practically all of this decline was at Smackover, which, however, easily retained its rank as the leading field of the State. The only field to show an increased output in 1927 was Irma, Nevada County, whose output was 774,000 barrels, as compared with 763,000 barrels in 1926.

Development work in Arkansas in 1927 was considerably hampered by low prices and floods. Some attention was given to deeper drilling in the pioneer fields, the principal result of which was the discovery of a fifth sand at Smackover at about 2,780 feet. The wells in this sand were all small, and their output did little to curb the decline of the field as a whole.

The most important development of the year in Arkansas was the discovery of Champagnolle or Rainbow field about 15 miles northeast of El Dorado. Two sands, at about 2,750 and 3,000 feet, have been uncovered, and while the production of the first few wells drilled was erratic the outlook at the close of the year was promising.

Petroleum produced in Arkansas, 1921–1927, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Bradley	El Dorado	Irma	Lisbon	Smackover	Stephens	Total
1921		10, 473					10, 473
1922		10, 592			2, 107	13	12, 712
1923		5, 830	(1)		30, 048	[1] 732	36, 610
1924		4, 760	450		40, 000	818	46, 028
1925		4, 247	334		72, 144	673	77, 398
1926	52	2, 722	763	2, 125	52, 063	607	58, 332
1927	44	[2] 2, 433	774	1, 054	35, 201	499	40, 005

[1] Irma included with Stephens.

[2] Includes Champagnolle.

Petroleum produced in Arkansas, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
Bradley	-----	1	2	5	4	5	4	4	7	7	7	6	52	--------	52
El Dorado	281	257	202	222	262	276	237	227	200	215	200	198	2, 777	−55	2, 722
Irma	43	43	47	48	68	134	78	106	98	78	67	61	871	−108	763
Lisbon	-----	8	84	205	286	234	267	248	229	186	158	166	2, 071	54	2, 125
Smackover	5, 149	4, 600	4, 867	4, 886	4, 777	4, 384	4, 460	4, 338	4, 132	4, 078	3, 813	3, 765	53, 249	−1, 186	52, 063
Stephens	44	41	43	48	46	48	59	46	49	60	53	45	582	25	607
	5, 517	4, 950	5, 245	5, 414	5, 443	5, 081	5, 105	4, 969	4, 715	4, 624	4, 298	4, 241	59, 602	−1, 270	58, 332
1927															
Bradley	4	5	3	2	3	3	4	3	3	2	3	2	37	7	44
El Dorado [1]	215	195	226	207	217	195	201	201	182	199	189	210	2, 437	−4	2, 433
Irma	57	52	57	44	42	45	51	57	80	85	99	85	754	20	774
Lisbon	125	108	110	98	94	84	80	79	68	70	62	62	1, 040	14	1, 054
Smackover	3, 607	3, 151	3, 395	2, 902	3, 079	2, 959	2, 937	2, 879	2, 719	2, 794	2, 534	2, 440	35, 396	−195	35, 201
Stephens	47	40	48	44	44	40	44	37	42	39	38	38	501	−2	499
	4, 055	3, 551	3, 839	3, 297	3, 479	3, 326	3, 317	3, 256	3, 094	3, 189	2, 925	2, 837	40, 165	−160	40, 005

[1] Includes Champagnolle.

California.—The production in California in 1927 amounted to 231,196,000 barrels, as compared with 224,673,000 barrels in 1926. Although the 1927 total was the highest for any year, with the exception of 1923 and 1925, the State surrendered first place among the producing States to Oklahoma.

Just as the discovery of the Seal Beach field was the outstanding development in California in 1926, so the production in this field was the largest single factor in the increased output of the State in 1927. The total output of the field in 1927 was 16,501,000 barrels, as compared with 587,000 barrels in 1926. The largest part of the 1927 output came from the Alamitos Heights extension which, because of the town-lot character of the leases, was much more rapidly developed than the older part of the field. Long Beach, one of the most remarkable fields ever discovered, retained its rank as the leading producing field of the State; in October a new deep sand was discovered at slightly less than 6,000 feet and by the end of the year gave promise of being a large producer in 1928. The production of Santa Fe Springs continued to decline; rapid drilling in the town-lot extension to the west was the major factor in the increased output at Huntington Beach. Development work at Ventura Avenue was continued, and the field made a substantial gain in output over 1926. During the year the importance of this field was increased both by areal extensions and by successful deeper drilling. The producing formations at Ventura Avenue are so thick that some wells were completed as large producers at about 7,000 feet and were still in the sand. The old Kern River field was the center of considerable activity, nearly all of which was along the comparatively newly discovered west-front extension.

Four new fields were discovered in California in 1927—Rincon, or Seacliff, on the coast northwest of Ventura, which was somewhat of a disappointment; Round Mountain, near Bakersfield, which, because of the heavy character of the oil and lack of a pipe-line outlet, was not extensively developed; Potrero between the Inglewood and Rosecrans fields, which was of particular interest in that it supplied the last link to the chain of fields extending in an unbroken line from Beverly Hills southeastward to Newport; Goleta, 10 miles west of Santa Barbara and the most northerly field yet found in the Los Angeles Basin, which, while disappointing as to production, was of particular interest because of the high gravity of the oil (42.0°).

Wildcatting since 1922 had centralized in the Los Angeles basin but in 1927 showed a tendency to move northward into the much larger San Joaquin Basin. This movement was a result of a realization that the possibilities in the Los Angeles Basin were rapidly growing less promising and of the success obtained by drilling at Round Mountain, Mount Poso, Union Avenue, Edison, and Fruitvale, all near Bakersfield.

Petroleum produced in California, 1923–1927, by counties [1]

[Thousands of barrels of 42 U. S. gallons]

County	1923	1924	1925	1926	1927
Fresno	5.061	10,156	7,774	7,340	7,202
Kern	45,953	61,175	58,853	54,550	51,570
Los Angeles	158,665	119,028	121,214	105,826	103,626
Orange	46,475	31,661	32,734	37,989	46,594
San Luis Obispo	33	31	30	28	17
Santa Barbara	3,062	2,905	2,647	1,925	2,174
Santa Clara	[2] 16	[3] 19	[3] 18	[4] 21	[5] 16
Ventura	3,611	3,958	9,222	16,994	19.997
	262,876	228,933	232,492	224,673	231,196

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[1] Division of Mines and Mining, Department of Natural Resources, California.

[2] Includes San Mateo.

[3] Includes San Mateo and San Bernardino.

[4] Includes Kings, San Bernardino, San Mateo, and Sonoma.

[5] Includes Colusa, Kings, San Bernardino, San Mateo, Santa Clara, and Sonoma

Petroleum produced in California, 1926–27, by fields

[Barrels of "clean oil," from Division of Mines and Mining, Department of Natural Resources, California]

Field	1926			1927		
	Jan. 1 to June 30	July 1 to Dec. 31	Total	Jan. 1 to June 30	July 1 to Dec. 31	Total
District No. 1:						
Beverly Hills	70, 279	76, 270	146, 549	71, 504	66, 088	137, 592
Brea Olinda	3, 045, 448	4, 016, 252	7, 061, 700	3, 930, 197	3, 138, 127	7, 068, 324
Coyote Hills	3, 069, 573	2, 956, 893	6, 026, 466	2, 635, 661	2, 560, 840	5, 196, 501
Dominguez	3, 911, 290	3, 927, 927	7, 839, 217	3, 181, 346	2, 743, 018	5, 924, 364
Huntington Beach	8, 168, 887	11, 079, 825	19, 248, 712	14, 474, 673	11, 889, 726	26, 364, 399
Inglewood	9, 722, 917	7, 921, 104	17, 644, 021	6, 844, 144	6, 075, 843	12, 919, 987
Long Beach	19, 624, 052	17, 955, 897	37, 579, 949	16, 691, 199	17, 644, 691	34, 335, 890
Montebello	3, 293, 288	3, 306, 294	6, 599, 582	2, 937, 773	2, 561, 427	5, 499, 200
Newhall	34, 346	35, 372	69, 718	33, 855	34, 411	68, 266
Newport	17, 080	15, 617	32, 697	11, 227	11, 560	22, 787
Richfield	2, 382, 556	3, 240, 458	5, 623, 014	3, 820, 861	4, 122, 070	7, 942, 931
Rosecrans	3, 507, 322	2, 560, 649	6, 067, 971	1, 970, 204	1, 531, 666	3, 501, 870
Salt Lake	175, 756	177, 111	352, 867	173, 268	162, 076	335, 344
Santa Fe Springs	9, 059, 025	8, 669, 116	17, 728, 141	7, 897, 094	7, 325, 631	15, 222, 725
Seal Beach		587, 448	587, 448	6, 262, 664	10, 238, 107	16, 500, 771
Torrance	5, 310, 498	4, 982, 824	10, 293, 322	4, 437, 919	3, 927, 537	8, 365, 456
Whittier	385, 826	373, 926	759, 752	342, 488	321, 662	664, 150
	71, 778, 143	71, 882, 983	143, 661, 126	75, 716, 077	74, 354, 480	150, 070, 557
Los Angeles City field	[1] 74, 857	[1] 75, 000	149, 857	[1] 75, 000	[1] 75, 000	150, 000
District No. 2:						
Bardsdale	170, 015	168, 114	338, 129	157, 564	149, 577	307, 141
Conejo	[2] 1, 391	200	1, 591	804	755	1, 559
Ojai	35, 061	33, 213	68, 274	32, 305	29, 822	62, 127
Piru	81, 956	90, 982	172, 938	77, 105	62, 365	139, 470
Rincon					7, 888	7, 888
Santa Paula	10, 147	10, 429	20, 576	10, 068	13, 315	23, 383
Sespe	24, 352	22, 997	47, 349	30, 698	35, 316	66, 014
Simi	26, 070	24, 762	50, 832	23, 046	23, 652	46, 698
South Mountain	700, 487	722, 374	1, 422, 861	727, 616	748, 309	1, 475, 925
Ventura	5, 684, 223	9, 187, 502	14, 871, 725	8, 621, 363	9, 245, 273	17, 866, 636
	6, 733, 702	10, 260, 573	16, 994, 275	9, 680, 569	10, 316, 272	19, 996, 841
District No. 3:						
Arroyo Grande	12, 975	15, 007	27, 982	8, 747	7, 962	16, 709
Casmalia	32, 356	20, 367	52, 723	14, 636	15, 427	30, 063
Cat Canyon	379, 021	390, 380	769, 401	427, 650	519, 465	947, 115
Goleta				32, 851	61, 342	94, 193
Half Moon Bay [2]	388	388	776	388	388	776
Lompoc	16, 457		16, 457			
Moody Gulch					706	706
Santa Maria	543, 931	519, 964	1, 063, 895	491, 304	571, 191	1, 062, 495
Sargent	6, 315	6, 270	12, 585	5, 855	5, 433	11, 288
Summerland [2]	16, 458	16, 786	33, 244	19, 829	20, 192	40, 021
	1, 007, 901	969, 162	1, 977, 063	1, 001, 260	1, 202, 106	2, 203, 366
District No. 4:						
Belridge-Lost Hills-Devils Den	808, 090	870, 037	1, 678, 127	784, 023	719, 297	1, 503, 320
Elk Hills	5, 850, 940	6, 291, 218	12, 142, 158	5, 332, 365	4, 645, 968	9, 978, 333
Kern River	2, 056, 614	2, 169, 833	4, 226, 447	2, 413, 075	3, 435, 416	5, 848, 491
McKittrick-Temblor	1, 013, 965	993, 144	2, 007, 109	955, 816	916, 272	1, 872, 088
Midway-Sunset	16, 908, 188	17, 161, 821	34, 070, 009	16, 426, 858	15, 511, 929	31, 938, 787
Mount Poso		52, 124	52, 124	26, 459	15, 544	42, 003
Round Mountain					12, 808	12, 808
Wheeler Ridge	178, 405	195, 247	373, 652	189, 298	185, 284	374, 582
	26, 816, 202	27, 733, 424	54, 549, 626	26, 127, 894	25, 442, 518	51, 570, 412
District No. 5:						
Coalinga	3, 685, 394	3, 654, 708	7, 340, 102	3, 627, 648	3, 574, 637	7, 202, 285
Kings County					1, 510	1, 510
Sonoma County		1, 232	1, 232	707	95	802
	3, 685, 394	3, 655, 940	7, 341, 334	3, 628, 355	3, 576, 242	7, 204, 597
Grand total	[1] 110, 096, 199	[1] 114, 577, 082	224, 673, 281	[1] 116, 229, 155	[1] 114, 966, 618	231, 195, 773

[1] Semiannual figures for Los Angeles City field estimated.

[2] Estimated.

Petroleum produced in California, 1926–27, by districts and months [1]

[Thousands of barrels of 42 U. S. gallons]

District	January	February	March	April	May	June	July	August	September	October	November	December	The year
1926													
Coalinga	588	575	651	630	629	615	617	603	582	612	593	601	7,296
Coyote	532	464	523	513	523	502	515	510	495	503	465	486	6,031
Dominguez	730	627	645	630	653	616	650	681	671	682	608	609	7,802
Elk Hills	937	904	1,032	980	1,042	1,054	1,053	1,079	1,041	1,061	1,037	1,073	12,293
Fullerton	436	423	562	539	542	514	528	582	602	683	746	830	6,987
Huntington Beach	1,426	1,266	1,424	1,327	1,363	1,302	1,356	1,376	1,356	1,681	2,260	2,928	19,065
Inglewood	1,768	1,542	1,645	1,554	1,589	1,484	1,442	1,387	1,276	1,279	1,198	1,226	17,390
Kern River	370	344	374	358	369	352	350	357	348	384	370	382	4,358
Long Beach	3,460	3,186	3,433	3,287	3,307	3,193	3,290	3,111	2,913	2,963	2,865	2,924	37,932
Los Angeles-Salt Lake	57	54	59	55	55	54	57	57	57	59	55	57	676
Lost Hills-Belridge	136	119	138	139	143	141	143	143	144	151	145	152	1,694
McKittrick	174	151	169	165	167	161	165	162	161	165	155	166	1,961
Midway-Sunset	2,875	2,584	2,884	2,827	2,924	2,817	2,913	2,894	2,826	2,894	2,734	2,797	33,969
Montebello	549	498	548	540	555	553	573	560	534	540	525	540	6,515
Richfield	397	368	406	389	402	422	446	543	541	540	538	582	5,574
Rosecrans	730	601	629	542	514	506	484	422	408	443	444	391	6,114
Santa Fe Springs	1,530	1,397	1,535	1,472	1,497	1,455	1,516	1,500	1,418	1,425	1,355	1,347	17,447
Santa Maria	161	158	168	149	158	154	148	155	149	155	149	148	1,852
Seal Beach								32	53	54	153	295	587
Summerland	4	3	4	4	4	4	4	4	4	4	4	4	47
Torrance	952	819	906	887	928	873	874	870	810	824	797	815	10,355
Ventura Avenue	975	823	814	829	1,019	1,208	1,334	1,451	1,439	1,565	1,700	1,639	14,796
Ventura-Newhall	183	168	173	177	185	191	186	188	182	196	185	190	2,204
Wheeler Ridge	29	27	30	30	29	32	33	33	31	33	33	32	372
Whittier	66	59	68	64	66	62	63	62	59	63	55	59	746
Other	5	4	6	5	4	4	3	3	5	7	4	4	54
	19,070	17,164	18,826	18,092	18,667	18,269	18,743	18,765	18,105	18,966	19,173	20,277	224,117
Division of Mines and Mining, Department of Natural Resources, California [2]	19,047	17,175	18,826	18,056	18,716	18,276	18,790	18,905	18,218	19,020	19,249	20,395	224,673

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[1] Monthly figures by districts from American Petroleum Institute.

[2] Monthly figures prorated from annual and semiannual totals.

Petroleum produced in California, 1926–27, by districts and months[1]—Continued

[Thousands of barrels of 42 U. S. gallons]

District	January	February	March	April	May	June	July	August	September	October	November	December	The year
1927													
Coalinga	617	556	608	620	622	595	609	596	581	593	576	582	7, 155
Coyote	475	415	439	436	443	412	419	410	422	436	410	430	5, 147
Dominguez	572	520	566	515	508	477	494	471	457	464	422	422	5, 888
Elk Hills	1, 064	958	1, 037	862	770	750	800	772	780	793	744	743	10, 073
Fullerton	782	688	753	678	491	507	553	569	518	525	481	464	7, 009
Goleta	-------	1	9	6	5	11	10	11	9	10	8	7	87
Huntington Beach	2, 860	2, 349	2, 408	2, 304	2, 385	2, 195	2, 156	2, 125	1, 940	1, 941	1, 828	1, 854	26, 345
Inglewood	1, 226	1, 072	1, 154	1, 114	1, 111	1, 031	1, 064	1, 042	989	1, 012	957	979	12, 751
Kern River	410	385	406	418	436	470	501	527	540	610	674	721	6, 098
Long Beach	2, 870	2, 607	2, 933	2, 801	2, 855	2, 804	2, 868	2, 821	2, 705	2, 906	3, 012	3, 360	34, 542
Los Angeles-Salt Lake	54	51	55	55	54	54	53	54	50	50	51	50	631
Lost Hills-Belridge	149	132	151	127	119	114	114	122	120	123	115	129	1, 515
McKittrick	164	144	160	158	157	156	155	157	149	153	150	153	1, 856
Midway-Sunset	2, 805	2, 508	2, 748	2, 765	2, 795	2, 690	2, 675	2, 635	2, 541	2, 561	2, 441	2, 507	31, 671
Montebello	542	464	506	484	476	456	448	438	437	440	406	401	5, 498
Mount Poso	7	6	5	4	2	2	1	1	2	3	4	3	40
Richfield	631	592	637	644	657	660	706	687	663	664	673	670	7, 884
Rosecrans	371	329	337	350	316	280	272	264	238	241	244	264	3, 506
Santa Fe Springs	1, 385	1, 243	1, 344	1, 299	1, 331	1, 260	1, 281	1, 233	1, 198	1, 213	1, 163	1, 203	15, 153
Santa Maria	144	139	152	152	154	167	178	181	171	182	197	182	1, 999
Seal Beach	313	444	806	1, 140	1, 531	1, 990	1, 791	1, 786	1, 914	1, 892	1, 500	1, 318	16, 425
Summerland	4	4	4	5	4	4	4	4	4	4	4	4	49
Torrance	799	702	752	727	739	700	707	683	642	642	615	631	8, 339
Ventura Avenue	1. 673	1, 421	1, 582	1, 552	1, 258	1, 125	1, 183	1, 421	1, 725	1, 712	1, 572	1, 585	17, 809
Ventura-Newhall	171	170	186	187	188	179	190	184	182	193	183	185	2, 198
Wheeler Ridge	33	29	35	31	32	31	31	32	33	28	29	31	375
Whittier	61	51	60	56	63	53	53	51	52	54	52	54	660
Other	3	3	3	4	4	8	3	2	2	4	5	7	48
	20, 185	17, 983	19, 836	19, 494	19, 506	19, 181	19, 319	19, 279	19, 064	19, 449	18, 516	18, 939	230, 751
Division of Mines and Mining, Department of Natural Resources, California[2]	20, 192	17, 990	19, 844	19, 501	19, 514	19, 188	19, 386	19, 347	19, 131	19, 517	18, 581	19, 005	231, 196

[1] Monthly figures by districts from American Petroleum Institute.

[2] Monthly figures prorated from annual and semiannual totals.

Colorado.—Colorado was the only State in the Rocky Mountain district that showed an increase in production and in completions in 1927 over 1926. The total output in 1927 was 2,831,000 barrels, as compared with 2,768,000 barrels in 1926. All of the fields, with the exception of Moffat, reported gains in output over the previous year.

The Florence field aroused considerable attention, following the discovery of the Canon City extension, with the result that the output in 1927 was virtually double that of 1926. The most important event of the year in Colorado was the discovery of oil in the Morrison and Sundance sands in both the Iles Dome and Moffat fields. This important finding considerably enhanced the possibilities of a number of structures that in earlier tests had yielded nothing but water in the Dakota sands.

Petroleum produced in Colorado, 1918–1927, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Boulder	Florence	Fort Collins	Iles Dome	Moffat	Rangely	Tow Creek	Other	Total
1918	4	135						4	143
1919	5	102				14			121
1920	7	88				16			111
1921	5	83				20			108
1922	4	70				23			97
1923	4	62				20			86
1924	4	70	86		256	29			445
1925	3	97	430	17	605	32	42		1, 226
1926	2	148	1, 222	24	1, 199	33	140		2, 768
1927	(1)	[2] 291	1, 260	263	670	[3] 69	278		2, 831

[1] Included in Rangely. [2] Includes Canon City. [3] Includes Boulder and Walden.

Petroleum produced in Colorado, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
Boulder Rangely	3	2	2	3	2	2	3	4	4	4	3	3	35		35
Florence	11	11	11	10	12	14	13	12	14	15	13	12	148		148
Fort Collins	68	71	79	81	80	120	149	126	108	108	108	120	1, 218	4	1, 222
Iles Dome	4	2	3	2	2	2	2	2	1	1	1	1	23	1	24
Moffat	89	103	99	86	117	110	108	100	92	84	90	89	1, 167	32	1, 199
Tow Creek	3	3	3	4	3	5	21	27	22	19	16	14	140		140
	178	192	197	186	216	253	296	271	241	231	231	239	2, 731	37	2, 768
1927															
Boulder Rangely [1]	3	5	10	8	5	4	5	5	4	5	2	1	57	12	69
Florence [2]	10	15	20	24	26	28	31	31	27	28	25	26	291		291
Fort Collins	126	112	119	113	109	98	109	101	93	93	91	98	1, 262	−2	1, 260
Iles Dome	1	1	2	46	15	15	16	15	16	34	46	47	254	9	263
Moffat	82	71	70	61	58	45	52	48	47	43	40	32	649	21	670
Tow Creek	11	17	23	48	30	27	28	29	21	15	15	13	277	1	278
	233	221	244	300	243	217	241	229	208	218	219	217	2, 790	41	2, 831

[1] Includes Walden [2] Includes Canon City.

Kansas.—Despite a material curtailment in development work the production of crude petroleum in Kansas in 1927 showed but a small decrease from 1926. The total output for the year was 41,069,000 barrels, as compared with 41,498,000 barrels in 1926. Because of the much larger decline in Arkansas in 1927, Kansas ranked fourth as a producing State. The number of oil wells completed dropped from 1,458 in 1926 to 685 in 1927, but the average daily initial production rose from 119 to 143 barrels. Because of the unusual success in the Oxford and Churchill pools, Sumner County became the leading producing county in the State and more than compensated for the material decline in the Teeter-Pixley district of Greenwood County. Two pools—Oxford, Sumner County, and Lost Springs, Marion County—were discovered during the year. Although somewhat curtailed by the low price of crude, wildcatting was fairly active, and several important extensions and new discoveries were made. Perhaps the most important discovery was the prospect of oil in Rooks County in the northern part of the State.

Petroleum produced in Kansas, 1926–27, by districts and months [1]

[Thousands of barrels of 42 U. S. gallons]

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926													
Anderson	99	91	99	99	104	101	100	96	90	99	90	93	1,161
Butler:													
Eldorado	200	171	199	192	202	195	202	203	190	212	217	223	2,406
Leon-Weaver	22	19	19	23	28	27	49	54	58	71	67	69	506
Other	589	508	659	647	669	640	635	649	625	639	592	613	7,465
Cowley:													
Rainbow	199	127	140	134	130	114	123	106	80	92	91	69	1,405
Winfield-New Salem	64	60	64	58	58	59	75	72	62	82	79	82	815
Other	162	137	146	150	150	139	158	150	137	143	131	120	1,723
Greenwood-Woodson:													
Seely	278	284	347	395	453	434	483	499	463	464	423	433	4,956
Teeter-Pixley	576	542	617	600	633	605	613	593	538	515	463	481	6,776
Virgil	140	129	140	139	142	132	142	138	136	149	141	144	1,672
Other	307	275	296	277	288	270	308	330	330	319	328	343	3,671
Russell	158	158	179	167	179	164	159	148	139	142	135	130	1,858
Sumner	2	1	2	10	10	10	11	107	104	285	346	360	1,248
Other	455	390	428	439	471	456	524	536	498	503	491	494	5,685
	3,251	2,892	3,335	3,330	3,517	3,346	3,582	3,681	3,450	3,715	3,594	3,654	41,347
Bureau of Mines [2]	3,199	2,932	3,248	3,395	3,522	3,624	3,740	3,685	3,498	3,610	3,461	3,584	41,498
1927													
Anderson	90	78	82	68	74	69	70	58	57	59	63	64	832
Butler:													
Eldorado	218	194	241	238	244	234	239	242	225	238	220	226	2,759
Leon-Weaver	70	65	74	39	100	72	109	117	109	108	102	105	1,070
Other	611	539	600	620	597	569	563	557	517	522	492	502	6,689
Cowley:													
Rainbow	89	70	73	63	71	64	67	65	62	62	58	59	803
Winfield-New Salem	85	72	86	122	113	107	101	114	110	106	95	96	1,207
Other	123	107	118	105	110	104	111	108	105	105	98	100	1,294
Greenwood-Woodson:													
Seely	419	377	384	351	355	330	318	302	295	291	262	253	3,937
Teeter-Pixley	434	371	390	357	342	318	326	318	289	287	266	260	3,958
Virgil	137	123	134	132	131	126	140	163	168	175	191	201	1,821
Other	313	278	290	258	254	242	237	239	216	220	201	199	2,947
Russell	109	95	97	88	94	87	86	79	75	81	67	68	1,026
Sumner	499	458	519	527	592	551	517	479	527	665	634	740	6,708
Other	573	525	587	549	627	565	570	601	587	590	565	554	6,893
	3,770	3,352	3,675	3,517	3,704	3,438	3,454	3,442	3,342	3,509	3,314	3,427	41,944
Bureau of Mines [2]	3,575	3,342	3,608	3,496	3,586	3,452	3,374	3,357	3,283	3,441	3,277	3,278	41,069

[1] Monthly estimates by districts from Oil and Gas Journal.

[2] Separation by fields not available.

Louisiana.—The production of crude petroleum in Louisiana in 1927 amounted to 22,818,000 barrels, which represents a small decline from 1926. The total output of the salt-dome fields increased for the fifth successive year, but the increase was more than counterbalanced by decreased output in such northern fields as Cotton Valley and Haynesville.

The most important pool in the salt-dome district was Lockport, which recorded a 52 per cent increase in output in 1927. The value of the geophysical work performed in south Louisiana during the past several years was apparent in 1927 when the new pools of Starks, Hackberry, Iberia, and Sulphur, all discovered by such methods, reported commercial production. The most important was the Starks pool whose output was 262,000 barrels.

The most notable event of the year with respect to new production was the discovery of two deep productive sands in the Trinity formation of the Pine Island field of Caddo Parish. The development work that followed enabled the Caddo district to increase its output materially in 1927, whereas a decrease would normally have been expected.

The search for oil in northern Louisiana in 1927 was not nearly so successful as that for gas and led to the discovery of only one small field, Pleasant Hill, in Sabine Parish; it yielded small wells but of comparatively high-grade oil.

Petroleum produced in Louisiana, 1918–1927, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Gulf coast (salt-dome pools)							
	Anse la Butte	Edgerley	Jennings	Lockport	Starks	Vinton	Other	Total
1918	[1] 3	512	369			1,839	15	2,738
1919		361	347			1,592	9	2,309
1920		379	232			1,333	3	1,947
1921	47	250	254			1,379		1,930
1922	36	125	191			1,395		1,747
1923	18	157	204			2,071		2,450
1924	12	166	213	128		1,968		2,487
1925	17	185	278	471		2,274	[2] 2	3,227
1926	17	207	342	1,343		2,215	[3] 16	4,140
1927	17	467	299	2,038	262	1,786	[4] 181	5,050

Year	Northern											Total for State
	Bellevue	Caddo	Cotton Valley	De Soto	Elm Grove	Haynesville	Homer	Red River (Bull Bayou, Crichton)	Urania	Other	Total	
1918		11,144		1,066				1,046		49	13,305	16,043
1919		[1] 8,700		[1] 1,200			[1] 2,000	[1] 2,900		79	14,879	17,188
1920		6,336		(5)			21,508	[5] 5,923			33,767	35,714
1921		5,342		719		3,161	13,030	2,844		77	25,173	27,103
1922	1,050	4,498		531	160	19,939	5,673	1,778			33,629	35,376
1923	2,351	4,178		429	220	10,496	3,581	1,207		7	22,469	24,919
1924	1,749	4,319	1,211	353	217	6,720	2,837	1,231			18,637	21,124
1925	1,129	4,067	3,348	305	212	4,604	2,296	1,074	10		17,045	20,272
1926	788	4,749	2,914	321	222	3,328	2,033	1,037	3,669		19,061	23,201
1927	472	5,789	1,968	541	222	2,600	1,785	1,070	3,321		17,768	22,818

[1] Estimated.
[2] Welsh.
[3] Sweet Lake and Welsh.
[4] Hackberry, Iberia, Sulphur, Sweet Lake, and Welsh.
[5] De Soto included with Red River.

Petroleum produced in Louisiana, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
Gulf coast (salt-dome pools):															
Anse la Butte [1]	1	-----	1	1	-----	2	3	2	1	1	2	8	22	11	33
Edgerley	11	13	24	14	17	18	21	20	18	14	14	16	200	7	207
Jennings	24	22	27	27	31	26	33	30	27	25	24	29	325	17	342
Lockport	64	76	100	115	72	79	130	155	134	64	93	87	1,169	174	1,343
Vinton	211	179	196	178	178	182	205	180	163	170	162	163	2,167	48	2,215
	311	290	348	335	298	307	392	387	343	274	295	303	3,883	257	4,140
Northern:															
Bellevue	80	53	67	73	77	103	53	69	61	54	53	47	790	−2	788
Caddo	350	328	370	341	400	400	405	410	399	436	434	461	4,734	15	4,749
Cotton Valley	286	232	260	286	286	260	271	189	227	215	200	204	2,916	−2	2,914
De Soto	28	25	26	26	26	24	27	27	29	27	27	29	321	-----	321
Elm Grove	18	17	24	20	18	18	19	18	18	18	17	17	222	-----	222
Haynesville	319	280	312	292	309	284	279	287	260	259	220	243	3,344	−16	3,328
Homer	182	161	177	171	174	167	173	173	168	167	158	165	2,036	−3	2,033
Red River (Bull Bayou, Crichton)	83	76	90	88	87	85	90	91	88	86	85	88	1,037	-----	1,037
Urania	2	56	183	267	409	420	374	363	377	355	348	348	3,502	167	3,669
	1,348	1,228	1,509	1,564	1,786	1,761	1,691	1,627	1,627	1,617	1,542	1,602	18,902	159	19,061
	1,659	1,518	1,857	1,899	2,084	2,068	2,083	2,014	1,970	1,891	1,837	1,905	22,785	416	23,201
1927															
Gulf coast (salt-dome pools):															
Anse la Butte [2]	5	12	9	14	13	14	3	1	1	1	2	45	120	78	198
Edgerley	16	21	18	15	45	30	29	73	61	51	47	57	463	4	467
Jennings	26	19	21	17	20	21	30	25	25	26	22	23	275	24	299
Lockport	99	79	175	222	212	217	194	167	162	186	163	162	2,038	-----	2,038
Starks	-----	7	55	45	30	24	19	13	22	14	7	8	244	18	262
Vinton	165	142	158	153	122	140	171	143	132	142	167	140	1,775	11	1,786
	311	280	436	466	442	446	446	422	403	420	408	435	4,915	135	5,050
Northern:															
Bellevue	47	47	49	42	38	41	37	35	37	32	34	31	470	2	472
Caddo	434	406	453	402	448	461	576	581	520	516	497	506	5,800	−11	5,789
Cotton Valley	191	163	176	171	178	165	164	167	155	155	142	140	1,967	1	1,968
De Soto	27	33	34	42	40	45	60	56	59	54	46	46	542	−1	541
Elm Grove	20	19	18	18	19	18	18	19	18	18	16	17	218	4	222
Haynesville	239	214	240	226	237	222	220	218	209	213	197	194	2,629	−29	2,600
Homer	162	146	160	156	156	151	147	147	139	144	139	139	1,786	−1	1,785
Red River (Bull Bayou, Crichton)	94	81	90	84	80	88	89	89	87	97	101	95	1,075	−5	1,070
Urania	376	341	314	285	229	237	265	288	266	269	213	231	3,314	7	3,321
	1,590	1,450	1,534	1,426	1,425	1,428	1,576	1,600	1,490	1,498	1,385	1,399	17,801	−33	17,768
	1,901	1,730	1,970	1,892	1,867	1,874	2,022	2,022	1,893	1,918	1,793	1,834	22,716	102	22,818

[1] Includes Sweet Lake and Welsh.

[2] Includes Hackberry, Iberia, Sulphur, Sweet Lake, and Welsh.

Montana.—The production of crude petroleum in Montana in 1927 amounted to 5,058,000 barrels, as compared with 7,727,000 barrels in 1926. This decline in the annual output was the first since the State became a producer of importance in 1921. All of the fields of the State showed decreased output in 1927. The decline of

Kevin-Sunburst, by far the most important field, was, of course, the most significant. Only two small fields, Pondera and Bannatyne, were discovered during the year, and development work in general was curtailed.

Petroleum produced in Montana, 1918–1927, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Cat Creek	Elk Basin	Kevin-Sunburst	Lake Basin	Other	Total
1918	----------	69	----------	----------	----------	69
1919	----------	90	----------	----------	----------	90
1920	243	97	----------	----------	----------	340
1921	1, 408	75	----------	----------	26	1, 509
1922	2, 333	46	36	----------	34	2, 449
1923	2, 227	28	523	----------	4	2, 782
1924	1, 572	24	1, 217	----------	2	2, 815
1925	1, 255	21	2, 780	31	4	4, 091
1926	1, 015	19	6, 630	63	----------	7, 727
1927	[1] 779	17	4, 214	48	----------	5, 058

[1] Includes small amounts from Bannatyne and Devils Basin.

Petroleum produced in Montana, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
Cat Creek	91	83	88	87	88	86	85	84	79	80	74	73	998	17	1, 015
Elk Basin	2	1	2	2	2	2	2	1	1	2	1	1	19	------	19
Kevin-Sunburst	283	392	682	643	685	700	805	693	555	494	394	286	6, 612	18	6, 630
Lake Basin	-----	-----	-----	-----	-----	4	18	10	10	8	3	4	57	6	63
	376	476	772	732	775	792	910	788	645	584	472	364	7, 686	41	7, 727
1927															
Cat Creek [1]	73	64	73	71	70	65	65	66	60	59	56	54	776	3	779
Elk Basin	1	1	2	1	2	1	2	1	2	2	1	1	17	------	17
Kevin-Sunburst	330	327	367	335	380	405	395	376	350	340	300	283	4, 183	26	4, 214
Lake Basin	4	5	4	4	2	3	4	12	3	3	4	2	50	−2	48
	408	397	446	411	454	474	466	455	415	404	361	340	5, 031	27	5, 058

[1] Includes small amounts from Bannatyne and Devils Basin.

New Mexico.—The production of crude petroleum in New Mexico in 1927 amounted to 1,226,000 barrels, as compared with 1,666,000 barrels in 1926. Although the output of the Artesia field fell off materially, it remained the leading field of the State. Production in the light-oil fields of Hogback and Rattlesnake declined little in 1927, despite the low prices. The Maljamar field, discovered in 1926, was the scene of some activity, which was attended by moderate success. The outstanding development of the year was the drilling of a number of wildcat tests in Lea and Eddy Counties, in the southeast part of the State, with the object of proving an extension to the Permian Basin of West Texas. This activity resulted in three important discoveries, two of which were gassers, spraying oil, and one, a small producer. The discoveries supplied valuable geologic information for a district almost barren of surface geology.

Petroleum produced in New Mexico, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
Artesia	111	90	98	96	93	83	80	77	72	73	69	64	1,006	10	1,016
Hogback	16	14	16	13	15	14	20	23	22	24	23	21	221	------	221
Maljamar	------	------	------	------	------	------	------	------	------	------	------	------	------	2	2
Rattlesnake[1]	5	8	13	6	50	30	33	30	62	42	67	82	428	−1	427
	132	112	127	115	158	127	133	130	156	139	159	167	1,655	11	1,666
1927															
Artesia	62	55	54	53	52	46	46	43	43	39	43	39	575	7	582
Hogback	23	24	25	23	21	23	13	13	15	8	19	20	227	−4	223
Maljamar	------	------	7	3	4	5	4	3	3	3	3	4	39	------	39
Rattlesnake[1]	46	57	55	67	23	16	22	22	11	14	11	17	361	21	382
	131	136	141	146	100	90	85	81	72	64	76	80	1,202	24	1,226

[1] Includes Bloomfield and Table Mesa in 1926 and Bloomfield, Hospah, and Table Mesa in 1927.

Oklahoma.—Although 1926 was a record-breaking year for crude production in Oklahoma, the 1927 output—277,775,000 barrels—exceeded that of 1926 by nearly 100,000,000 barrels. Of the 1927 total the Seminole district produced approximately 136,000,000 barrels and was the major factor in the increase for the State. Without Seminole the 1927 output for Oklahoma would have decreased, there would have been a shortage of crude in the United States, and prices undoubtedly would have been higher.

One new pool, Little River, was discovered in the Seminole district in 1927, raising the total of separate pools to five. Their output was as follows: Seminole City, 47,000,000 barrels; Earlsboro and Bowlegs, 37,000,000 each; Searight, 10,000,000; and Little River, 5,000,000. The peak for the district as a whole, 527,000 barrels, was reached on July 30 and was followed by a comparatively gradual decline aided by restrictive agreements in the newly discovered area.

Virtually all of the production at Seminole was obtained from the Wilcox sand, which is comparatively loose and friable in this field. Because of this characteristic the drainage problem was serious and a scramble for the first production resulted. Another important factor was the widespread use of the gas lift. The wells in some parts of the district, particularly those in the Bowlegs pool, were low in gas pressure and without the aid of the gas lift would probably have made only fair pumpers.

Most of the wildcatting in Oklahoma in 1927 was carried on in the vicinity of the Seminole district. Unusual success attended these efforts, and by the close of the year a number of new highs had been proven and were either shut down or pinched in to the 100 barrels allowed by the prorating committee.

Lowered prices seriously curtailed development work in the older fields which almost without exception suffered a loss in output. The finding of flush production at 6,000 feet in Logan County, the finding of a deep sand in the old Allen pool, and the extension eastward at Burbank were the most important of the few discoveries made.

Petroleum produced in Oklahoma, 1926–27, by districts and months [1]

[Thousands of barrels of 42 U. S. gallons]

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926													
Braman:													
North	76	68	75	73	78	81	85	126	233	339	568	564	2, 366
South	208	207	350	311	380	323	326	278	247	227	196	160	3, 213
Bristow-Kelleyville and Depew	685	616	684	706	715	864	875	806	775	799	780	775	9, 080
Burbank	1, 386	1, 211	1, 355	1, 274	1, 274	1, 344	1, 338	1, 466	1, 418	1, 524	1, 336	1, 427	16, 353
Cromwell	621	553	586	552	551	523	522	499	474	463	424	425	6, 193
Cushing-Shamrock	708	606	658	618	621	601	648	651	617	641	618	634	7, 621
Davenport	638	654	686	512	379	310	256	216	179	177	157	146	4, 310
Duncan	198	181	208	180	180	174	180	176	170	178	173	177	2, 175
Fox-Graham	353	329	370	369	358	343	322	338	333	341	324	334	4, 114
Garber	787	666	920	1, 118	1, 206	1, 108	1, 125	1, 002	1, 004	856	716	700	11, 208
Glenn-Sapulpa and Kiefer	267	244	282	262	285	282	277	268	259	266	255	257	3, 204
Grady County	6	10	22	39	27	19	43	40	41	43	71	110	471
Healdton	472	424	467	448	471	449	464	465	457	467	452	465	5, 501
Hewitt	390	343	382	361	355	336	362	347	335	336	322	332	4, 201
Osage (outside Burbank)	982	857	1, 006	972	1, 012	1, 018	1, 012	1, 050	1, 016	1, 022	1, 025	1, 069	12, 041
Papoose-Gilcrease	367	344	350	368	358	326	273	272	307	235	211	222	3, 633
Seminole	------	------	------	------	------	------	312	427	625	1, 916	3, 464	4, 483	11, 227
Sholem-Alechem	49	57	66	69	108	105	192	227	239	265	317	317	2, 011
Tonkawa	1, 357	1, 222	1, 283	1, 131	1, 144	1, 140	1, 155	1, 166	1, 205	1, 147	1, 035	882	13, 867
Wewoka	397	407	540	1, 105	989	874	995	1, 020	911	823	744	769	9, 574
Other	3, 728	3, 393	4, 023	4, 000	4, 016	3, 854	3, 895	3, 778	3, 621	3, 656	3, 689	3, 635	45, 288
	13, 675	12, 392	14, 313	14, 468	14, 507	14, 074	14, 657	14, 618	14, 466	15, 721	16, 877	17, 883	177, 651
Bureau of Mines [2]	13, 787	12, 706	14, 345	14, 466	14, 924	14, 424	14, 793	14, 844	14, 335	15, 891	16, 829	17, 851	179, 195
1927													
Braman:													
North	536	284	325	293	199	118	92	98	84	86	55	60	2, 230
South	148	120	262	144	96	108	85	80	74	67	101	70	1, 355
Bristow-Kelleyville and Depew	741	648	698	659	676	655	596	627	590	610	537	549	7, 586
Burbank	1, 408	1, 298	1, 476	1, 369	1, 423	1, 350	1, 280	1, 237	1, 113	1, 081	1, 071	1, 160	15, 266
Cromwell	431	379	432	411	399	389	388	376	307	351	329	329	4, 521
Cushing-Shamrock	647	554	611	583	594	578	574	583	591	557	522	548	6, 942
Davenport	131	111	122	113	110	98	100	96	90	90	83	81	1, 225
Duncan	155	147	166	197	178	170	157	170	155	161	171	175	2, 002
Fox-Graham	322	286	301	288	289	270	284	273	261	267	226	240	3, 307
Garber	667	547	584	529	488	424	368	364	334	347	326	315	5, 293
Glenn-Sapulpa and Kiefer	268	226	260	240	247	239	244	245	237	239	231	227	2, 903
Grady County	126	173	192	249	286	270	283	269	260	222	214	220	2, 764
Healdton	461	418	467	454	469	448	467	471	447	460	433	453	5, 448
Hewitt	318	278	311	305	309	288	305	295	280	294	277	279	3, 539
Osage (outside Burbank)	1, 016	906	965	959	964	944	933	927	892	885	874	878	11, 143
Papoose-Gilcrease	247	218	224	222	224	205	199	200	190	186	179	174	2, 468
Pearson	------	------	------	------	------	------	153	123	133	121	129	154	813
Seminole	5, 776	8, 264	9, 684	10, 077	10, 809	10, 995	14, 720	14, 596	13, 170	13, 417	12, 754	11, 689	135, 951
Sholem-Alechem	394	376	450	486	512	509	474	512	400	388	374	381	5, 256
Tonkawa	898	748	805	668	692	645	621	646	568	521	459	476	7, 747
Wewoka	683	463	527	529	612	575	579	486	428	408	320	290	5, 900
Other	3, 663	3, 308	3, 619	3, 433	3, 683	3, 552	3, 621	3, 609	3, 508	3, 489	3, 418	3, 460	42, 363
	19, 036	19, 752	22, 481	22, 208	23, 259	22, 830	26, 523	26, 283	24, 112	24, 247	23, 083	22, 208	276, 022
Bureau of Mines [2]	18, 596	19, 951	22, 341	21, 407	23, 400	23, 516	26, 810	26, 377	24, 424	24, 704	23, 767	22, 482	277, 775

[1] Monthly estimates by districts from Oil and Gas Journal.

[2] Separation by fields not available.

Texas.—The production of crude petroleum in Texas in 1927 reached a new high level—217,389,000 barrels, an increase over 1926 of approximately 50,000,000 barrels. To illustrate the steady growth of Texas as an oil-producing State, it may be cited that the annual output has shown an increase for every year since 1910.

In Texas the producing fields are widely scattered and differ greatly in character. For the purpose of this discussion they may be classified by major areas, as follows: North central Texas, east and south central Texas, Panhandle, west Texas, southwest Texas, and the gulf coast or salt-dome districts.

North Texas, an area of small wells but of high-grade oil, particularly suffered from the depressed prices of 1927, and little drilling work was done. However, careful operation and an increase in the average daily initial production of the completed wells resulted in an increase in total output; the 1927 total, 54,806,000 barrels, was the highest for any year since 1921. Although development work and wildcatting were reduced, a number of new discoveries were made, the most important of which occurred in Brown, Cooke, and Young Counties.

Production in east and south central Texas, or the Balcones fault zone, continued to decline rapidly, decreasing from 31,390,000 barrels in 1926 to 20,717,000 barrels in 1927. Development work and wildcatting were at a particularly low level in this area, and only two small fields, Cedar Creek, in Limestone County, and Dale, a serpentine field in Caldwell County, were discovered. The most important event of the year in this area was the discovery of oil in Carey Lake Dome on the boundary of Cherokee and Anderson Counties. This was the first discovery on an inland salt dome, and although no sustained production was developed it was regarded as a strike of the first importance and inaugurated an intensive search for new domes.

Daily production in the Panhandle fell steadily throughout the year, but the total output increased from 25,551,000 barrels in 1926 to 40,253,000 barrels in 1927. Improved transportation facilities stimulated production, but the increase was more than counterbalanced by the depressed prices. Wildcatting was extensive, and several new pools were discovered, most important of which were the McIlroy pool, south of the Borger pool, and Bowers pool, south of the Pampa pool. The wildcatters in the Panhandle, though sometimes unsuccessful in their quest for oil, often drilled into gas and in this way extended the limits of the already large reserve of natural gas.

The events of 1927 proved that the optimistic predictions made for the west Texas area in 1926 were underrated. Although prices for west Texas oil fell to 60 cents, the daily production increased from about 65,000 barrels at the beginning of the year to about 250,000 barrels at the end of the year. The latter figure by no means represents the possible maximum output, as the majority of the wells were pinched in in accordance with the transportation facilities available.

The total production of the west Texas district in 1927 amounted to 51,538,000 barrels, as compared with 14,758,000 barrels in 1926. The Big Lake field, which produced the major part of the output in 1926, was the only district to show a decrease in 1927. The fields of Crane and Upton Counties—that is, the Church-Fields, McCamey, and McElroy pools—supplied the greater part of the 1927 output, though the performances of the Yates and Hendricks fields in building up a substantial production in a few months were perhaps more noteworthy. The record of west Texas in 1927 was all the more remarkable because the majority of the wells were either shut down or pinched in to only a fraction of their potential output.

The leasing and wildcatting campaign continued unabated in west Texas, and a number of important new discoveries were made. The most important of these were the discovery of oil in northern Winkler County, just inside the New Mexico line; the finding of deep lime production in Howard County near the old Chalk field, the first discovery of this kind on the east side of the so-called Permian Basin; the linking of the McElroy and Church-Fields pools; and the discovery of the Waddell pool in Crane County.

Several new trunk pipe lines were laid from the west Texas fields to the Gulf ports in 1927. This work stimulated production, as the tank-building program had been curtailed because of the corrosive action of the sulphur in the west Texas crudes. Another factor that stimulated production was the encroachment of edge water in some fields, notably the Hendricks field in Winkler County.

Comparatively little development work was done in 1927 in the Southwest fields—that is, the fields in the vicinity of Laredo—and the output declined from 4,150,000 barrels in 1926 to 3,056,000 barrels in 1927. A few small oil pools were found, but the majority of the discoveries were confined to gas.

The production of the Gulf, or salt-dome fields, continued to increase and in 1927 amounted to 47,019,000 barrels, as compared with 41,135,000 barrels in 1926. Of the 1927 total the Spindletop field produced 20,751,000 barrels, or 44 per cent. Considerable effort was made to extend or find deeper zones in certain of the Gulf fields. This work resulted in some new production, particularly in the Pierce Junction, Big Creek, and Blue Ridge fields.

The desire of the major companies operating in the Gulf coast area to provide for the future by maintaining an ample reserve of promising oil land was never more apparent than in 1927. Geophysical parties, followed by leasing men, roamed all over the Gulf coast of Texas and Louisiana; as a result, a number of new salt domes were discovered. Oil was found in a few of these, but the majority remained untested at the end of the year.

Petroleum produced in Texas, 1918–1927, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Gulf coast (salt-dome pools)																				
	Batson	Big Creek	Blue Ridge	Boling	Damon Mound	Dayton	Goose Creek[1]	High Island	Hull	Humble	Markham	Moore	Orange	Piedras Pintas	Pierce Junction	Saratoga	Sourlake	South Liberty	Spindletop	West Columbia	Other	Total
1918	635	-------	-------	-------	[2] 283	9	8,944	-------	245	6,555	65	-------	-------	-------	-------	722	3,408	-------	557	(2)	47	21,470
1919	560	-------	-------	-------	191	8	5,770	-------	1,273	3,706	54	-------	-------	-------	-------	737	2,709	-------	407	5,611	31	21,057
1920	527	-------	92	-------	379	17	4,476	-------	3,909	3,607	57	-------	-------	-------	-------	849	2,024	-------	322	9,459	17	25,735
1921	495	-------	326	-------	666	40	4,640	-------	8,150	3,004	49	-------	470	-------	1,239	1,129	1,802	-------	344	12,081	6	34,441
1922	434	(3)	349	-------	754	29	4,766	-------	6,546	2,284	35	-------	5,345	-------	1,020	713	1,675	-------	289	11,126	5	35,370
1923	403	(3)	287	-------	628	35	6,026	-------	7,300	2,275	21	-------	4,649	-------	313	626	1,906	-------	326	5,994	32	30,821
1924	464	293	278	-------	520	36	3,967	-------	7,074	2,224	66	-------	3,958	-------	154	543	1,588	-------	359	4,536	22	26,082
1925	432	310	313	40	416	20	3,464	121	6,944	1,864	41	-------	4,816	17	265	514	1,444	4,416	412	4,031	5	29,885
1926	456	520	486	1,175	341	(3)	3,501	60	7,058	1,568	51	75	3,458	93	948	482	2,004	1,992	13,441	[4] 3,404	[5] 22	41,135
1927	462	1,243	1,210	753	312	(3)	3,102	96	5,685	1,485	109	22	1,803	(3)	2,954	413	1,593	1,084	20,751	[4] 3,686	[6] 256	47,019

Year	Rest of State																					Total for State
	East and south central Texas								North central Texas [8]	Panhandle [9]	Southwest Texas [10]	West Texas									Total	
	Callihan	Luling	Lytton Springs	Mexia [7]	Somerset-Medina	Thrall-Minerva-Rockdale	Other	Total				Big Lake	Chalk-Roberts	Crane-Upton	Hendricks	Westbrook	World	Yates	Other	Total		
1918	------	------	------	313	------	137	48	498	16,782	------	------	------	------	------	------	------	------	------	------	------	17,280	38,750
1919	------	------	------	269	43	91	60	463	57,846	------	------	------	------	------	------	------	------	------	------	------	58,309	79,366
1920	------	------	------	297	162	60	51	570	70,563	------	------	------	------	------	------	------	------	------	------	------	71,133	96,868
1921	------	------	------	6,137	324	52	48	6,561	65,164	------	------	------	------	------	------	------	------	------	------	------	71,725	106,166
1922	------	------	------	34,790	672	37	35	35,534	47,037	------	733	------	------	------	------	10	------	------	------	10	83,314	118,684
1923	------	2,248	------	50,827	1,030	247	38	54,390	43,896	------	1,786	12	------	------	------	118	------	------	------	130	100,202	131,023
1924	187	11,134	------	49,272	1,109	235	59	61,996	42,487	272	2,215	1,056	------	------	------	414	------	------	------	1,470	108,440	134,522
1925	98	8,979	2,603	42,353	873	255	58	55,219	46,013	1,132	2,688	8,900	------	------	------	811	------	------	------	9,711	114,763	144,648
1926	52	7,699	1,783	20,494	791	535	36	31,390	[11]49,932	25,551	4,150	10,937	([12])	2,204	------	[12]1,372	237	([3])	8	14,758	125,781	166,916
1927	29	6,169	784	12,417	767	508	43	20,717	[11]54,806	40,253	3,056	8,986	1,072	30,607	3,641	1,365	516	5,329	22	51,538	170,370	217,389

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[1] Includes Barbers Hill.

[2] Damon Mound includes West Columbia.

[3] Included under "Other."

[4] Includes 207,000 barrels produced in Nash in 1926, and 395,000 barrels in 1927.

[5] Brenham and Dayton.

[6] Bernard, Brenham, Dayton, Jacksonville, Kingsville, Piedras Pintas, and Raccoon Bend.

[7] Includes Corsicana, Nigger Creek, Powell, Richland, Wortham, and smaller fields in Falls, Freestone, Limestone, and Navarro Counties.

[8] Includes the districts in and between Wilbarger, Wichita, Clay, Montague, and Cooke Counties on the north and Runnels, Coleman, Brown, and Comanche Counties on the south.

[9] Carson, Gray, Hutchinson, and Wheeler Counties.

[10] Includes fields in Jim Hogg, Webb, and Zapata Counties and Duval County, except salt-dome field at Piedras Pintas.

[11] Includes 78,000 barrels produced in Noodle Creek in 1926, and 627,000 barrels in 1927.

[12] Westbrook includes Chalk and other small fields in Howard and Mitchell Counties.

Petroleum produced in coastal Texas salt-dome pools, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
Batson	32	37	34	38	40	36	35	34	37	42	37	41	443	13	456
Big Creek	28	40	35	28	27	28	70	58	49	37	43	57	500	20	520
Blue Ridge	17	24	15	17	25	19	40	32	36	48	69	109	451	35	486
Boling	144	118	90	157	137	65	67	75	75	68	64	79	1,139	36	1,175
Damon Mound	25	24	24	24	26	22	34	22	21	25	26	27	300	41	341
Goose Creek [1]	278	274	266	271	306	317	352	343	327	260	226	225	3,445	56	3,501
High Island	-----	12	2	1	15	1	1	1	5	4	2	1	45	15	60
Hull	486	517	550	602	584	529	526	536	611	668	608	559	6,776	282	7,058
Humble	126	152	121	138	127	123	135	128	130	126	113	110	1,529	39	1,568
Markham	2	1	3	2	2	2	3	3	3	6	3	15	45	6	51
Moore	7	10	5	3	5	20	8	2	3	-----	1	-----	64	11	75
Orange	423	340	410	339	323	266	256	244	216	193	195	193	3,398	60	3,458
Piedras Pintas	24	21	7	6	6	2	5	3	1	2	4	11	92	1	93
Pierce Junction	37	36	53	54	52	47	70	93	92	113	162	117	926	22	948
Saratoga	27	22	22	22	25	23	37	47	21	22	36	23	327	155	482
Sourlake	133	119	126	122	162	150	164	201	260	211	175	154	1,977	27	2,004
South Liberty	235	211	195	156	171	161	156	140	114	129	137	126	1,931	61	1,992
Spindletop	124	116	71	80	152	135	872	2,067	2,165	2,290	2,518	2,839	13,429	12	13,441
West Columbia [2]	274	239	281	265	233	282	322	355	306	276	278	284	3,395	9	3,404
Other [3]	1	1	1	1	1	1	1	1	-----	2	-----	1	11	11	22
	2,423	2,314	2,311	2,326	2,419	2,229	3,154	4,385	4,472	4,522	4,697	4,971	40,223	912	41,135
1927															
Batson	47	40	40	37	43	35	34	38	35	36	33	37	455	7	462
Big Creek	70	79	132	163	127	108	96	85	83	120	84	68	1,215	28	1,243
Blue Ridge	66	54	85	81	112	134	117	83	106	86	123	126	1,173	37	1,210
Boling	73	53	48	61	62	57	58	59	68	70	64	64	737	16	753
Damon Mound	25	27	25	24	26	23	24	25	23	25	18	24	289	23	312
Goose Creek [1]	237	200	248	290	285	252	262	276	264	265	254	235	3,068	34	3,102
High Island	11	19	15	16	8	6	4	3	1	1	-----	2	86	10	96
Hull	538	454	483	526	527	471	445	420	426	510	404	364	5,568	117	5,685
Humble	114	103	121	144	137	115	122	116	122	111	105	93	1,403	82	1,485
Markham	13	11	7	10	13	11	8	8	6	8	6	5	106	3	109
Moore	1	2	1	-----	4	3	2	1	2	1	2	2	21	1	22
Orange	172	142	157	160	167	163	161	152	140	127	119	117	1,777	26	1,803
Pierce Junction	182	196	246	206	260	232	186	172	219	304	351	389	2,943	11	2,954
Saratoga	27	52	52	101	27	32	42	71	31	31	21	42	529	−116	413
Sourlake	150	148	160	145	135	128	127	127	117	115	108	109	1,569	24	1,593
South Liberty	120	102	113	101	101	85	85	87	76	72	72	66	1,080	4	1,084
Spindletop	2,249	1,875	1,824	1,469	1,697	1,779	1,711	1,737	1,665	1,598	1,483	1,650	20,737	14	20,751
West Columbia [2]	373	315	336	318	302	299	300	278	300	290	294	290	3,695	−9	3,686
Other [4]	4	5	3	2	1	1	22	21	21	17	17	16	130	126	256
	4,472	3,877	4,096	3,854	4,034	3,934	3,806	3,759	3,705	3,787	3,558	3,699	46,581	438	47,019

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[1] Includes Barbers Hill.

[2] Includes 207,000 barrels produced in Nash in 1926, and 395,000 barrels in 1927.

[3] Brenham and Dayton.

[4] Bernard, Brenham, Dayton, Jacksonville, Kingsville, Piedras Pintas, and Raccoon Bend.

Petroleum produced in Texas (exclusive of salt-dome fields), 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
East and south central Texas:															
Calliham	6	5	4	5	4	4	4	5	4	3	4	4	52	----------	52
Luling	696	623	687	674	664	689	671	635	597	581	555	570	7,642	57	7,699
Lytton Springs	237	221	217	176	158	143	135	120	101	99	88	83	1,778	5	1,783
Mexia	1,969	1,776	1,844	1,706	1,678	1,586	1,636	1,763	1,803	1,691	1,545	1,500	20,497	−3	20,494
Somerset	72	60	69	62	80	61	64	62	68	61	59	73	791	----------	791
Thrall-Minerva	47	40	43	41	43	41	45	45	45	47	49	49	535	----------	535
Other	3	3	4	4	3	2	3	2	3	3	2	3	35	1	36
	3,030	2,728	2,868	2,668	2,630	2,526	2,558	2,632	2,621	2,485	2,302	2,282	31,330	60	31,390
North central Texas	3,706	3,361	3,867	3,860	3,991	3,993	4,342	4,339	4,302	4,663	4,681	4,764	49,869	63	49,932
Panhandle	100	99	124	378	1,031	1,489	2,074	2,873	3,441	4,627	4,530	4,590	25,356	195	25,551
Southwest Texas	187	183	207	266	257	351	446	505	451	440	415	413	4,121	29	4,150
West Texas:															
Big Lake	1,001	833	991	1,019	972	903	888	863	844	870	871	882	10,937	----------	10,937
Crane-Upton	--------	--------	3	3	19	23	119	178	287	418	493	607	2,150	54	2,204
Westbrook	88	77	94	102	107	96	111	111	104	126	134	137	1,287	85	1,372
World	--------	--------	4	5	13	23	28	28	31	31	29	33	225	12	237
Other	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	----------	8	8
	1,089	910,	1,092	1,129	1,111	1,045	1,146	1,180	1,266	1,445	1,527	1,659	14,599	159	14,758
	8,112	7,281	8,158	8,301	9,020	9,404	10,566	11,529	12,081	13,660	13,455	13,708	125,275	506	125,781

Petroleum produced in Texas (exclusive of salt-dome fields), 1926–27, by districts and months—Continued

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1927															
East and south central Texas:															
Calliham	3	2	3	3	2	3	3	3	2	2	2	1	29	----------	29
Luling	553	496	543	529	535	508	506	489	477	482	468	469	6,055	114	6,169
Lytton Springs	80	68	72	69	64	62	60	60	61	61	64	57	778	6	784
Mexia	1,344	1,139	1,217	1,135	1,101	1,019	1,003	968	902	903	848	823	12,402	15	12,417
Somerset-Medina	49	59	71	65	72	67	66	66	60	63	62	63	763	4	767
Thrall-Minerva-Rockdale	51	45	47	46	45	43	43	41	38	38	34	36	507	1	508
Other	2	2	2	3	3	3	2	3	3	2	3	4	32	11	43
	2,082	1,811	1,955	1,850	1,822	1,705	1,683	1,630	1,543	1,551	1,481	1,453	20,566	151	20,717
North central Texas	4,905	4,563	5,208	4,954	5,061	4,561	4,440	4,579	4,317	4,202,	3,967	3,788	54,545	261	54,806
Panhandle	3,982	3,571	3,583	3,697	4,120	3,958	3,396	3,128	2,909	2,841	2,549	2,498	40,232	21	40,253
Southwest Texas	377	303	312	287	270	246	235	231	214	208	195	190	3,068	−12	3,056
West Texas:															
Big Lake	861	753	811	796	807	745	753	755	714	692	658	641	8,986	----------	8,986
Chalk-Roberts	20	32	48	59	86	86	87	87	98	117	83	222	1,025	47	1,072
Crane-Upton	702	840	1,182	1,675	1,920	2,188	2,784	3,458	3,685	3,859	3,620	3,600	29,513	1,094	30,607
Hendricks	--------	14	20	29	32	41	46	87	260	398	779	1,682	3,388	253	3,641
Westbrook	123	104	122	117	118	113	118	130	114	107	102	105	1,373	−8	1,365
World	31	32	32	32	31	38	42	43	46	53	62	64	506	10	516
Yates	--------	--------	105	45	404	193	159	169	364	925	1,242	1,587	5,193	136	5,329
Other	1	1	1	1	1	1	1	1	1	1	2	2	14	8	22
	1,738	1,776	2,321	2,754	3,399	3,405	3,990	4,730	5,282	6,152	6,548	7,903	49,998	1,540	51,538
	13,084	12,024	13,379	13,542	14,672	13,875	13,744	14,298	14,265	14,954	14,740	15,832	168,409	1,961	170,370

Wyoming.—The production of crude petroleum in Wyoming in 1927 amounted to 21,307,000 barrels, a decline from the previous year of nearly 4,500,000 barrels—the fourth successive decline in the annual production of the State. The low price for crude and the decline in demand for refining purposes were the chief reasons for the decreased output. Salt Creek continued to decline, producing a total of 14,399,000 barrels, which, though a material drop from the previous year, was sufficient to meet refinery demands but does not indicate the true potentialities of this field. Further progress was made in the engineering work at Salt Creek—the work done in connection with reestablishing the gas pressure in the first Wall Creek sand was particularly notable.

Nearly all the remaining fields of the State declined; La Barge was a noteworthy exception; Mule Creek was shut down in 1926. Considerable development work was done at La Barge in 1927, and the construction of a pipe line to the field was projected.

The most important new discovery of the year in Wyoming was the proving of the Oregon Basin field. This field, comprising a structure comparable in size to Salt Creek, has been the scene of considerable wildcatting since 1912, but not until early in 1927 were various operating difficulties overcome and a sizable well completed. The oil, which comes from the Embar formation, is black with comparatively low gasoline content. In spite of this handicap, a fairly rapid development was under way at the close of the year.

Petroleum produced in Wyoming, 1918–1927, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Big Muddy	Byron-Greybull-Torchlight	Elk Basin	Ferris	Grass Creek	Hamilton Dome-Warm Springs	La Barge	Lance Creek	Lander-Dallas-Derby Dome	Lost Soldier
1918	3,082	45	1,067	--------	2,951	--------	--------	--------	48	--------
1919	3,104	27	740	(1)	2,049	--------	--------	461	62	[1] 167
1920	2,083	69	732	(1)	1,573	57	--------	353	84	[1] 135
1921	1,927	80	681	(1)	1,435	67	--------	346	119	[1] 524
1922	1,506	70	652	(1)	1,784	111	--------	282	149	[1] 751
1923	1,527	57	634	(1)	1,589	216	--------	363	137	[1] 1,551
1924	1,272	33	409	42	1,113	239	--------	786	133	1,733
1925	1,223	30	314	33	1,240	264	--------	360	152	1,713
1926	1,215	(2)	273	(1)	1,025	319	70	540	165	[1] 2,059
1927	1,072	28	337	(1)	974	313	341	269	246	1,341

Year	Mule Creek	Notches	Osage	Pilot Butte	Poison Spider-South Casper	Rex Lake	Rock Creek	Salt Creek	Teapot	Other	Total
1918	--------	--------	--------	62	--------	--------	--------	5,337	--------	4	12,596
1919	--------	--------	--------	91	--------	--------	242	6,225	--------	4	13,172
1920	182	--------	16	69	--------	--------	1,370	10,090	--------	18	16,831
1921	68	--------	176	46	--------	--------	1,681	12,172	--------	11	19,333
1922	168	--------	182	38	--------	--------	1,728	19,248	37	9	26,715
1923	--------	61	178	29	(2)	--------	1,429	35,770	1,156	88	44,785
1924	178	39	146	29	229	41	1,181	30,874	1,004	17	39,498
1925	129	35	109	25	297	20	1,087	21,445	632	65	29,173
1926	--------	34	113	20	[3] 376	53	1,029	18,010	426	49	25,776
1927	188	24	107	17	247	44	982	14,399	314	64	21,307

[1] Ferris included with Lost Soldier.
[2] Included under "Other."
[3] Includes Iron Creek and Simpson Ridge.

Petroleum produced in Wyoming, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
1926															
Big Muddy	100	96	107	103	109	105	102	101	100	98	93	90	1,204	11	1,215
Elk Basin	19	17	21	19	20	26	26	27	26	25	25	22	273	------	273
Grass Creek	81	75	81	80	86	89	97	93	86	87	84	86	1,025	------	1,025
Hamilton Dome	42	34	49	25	30	40	39	35	26	-----	-----	-----	320	−1	319
La Barge	6	5	5	3	6	5	4	7	5	7	3	8	64	6	70
Lance Creek	77	62	62	56	48	44	42	37	34	32	24	23	541	−1	540
Lander-Dallas	14	11	13	10	11	11	14	16	18	17	14	13	162	3	165
Lost Soldier-Ferris	146	133	160	151	159	166	159	85	220	121	223	168	1,891	168	2,059
Notches	-----	-----	-----	-----	-----	9	9	8	7	1	-----	-----	34	------	34
Osage	9	10	10	10	10	9	10	9	9	8	8	9	111	2	113
Poison Spider-South Casper-Iron Creek	13	10	15	22	25	25	54	44	24	27	24	25	308	11	319
Rex Lake	-----	-----	-----	-----	4	7	9	8	8	7	7	7	57	−4	53
Rock Creek	88	79	91	90	91	86	86	86	84	86	79	84	1,030	−1	1,029
Salt Creek	1,824	1,650	1,707	1,611	1,581	1,493	1,413	1,448	1,351	1,388	1,292	1,235	17,993	17	18,010
Simpson Ridge	8	7	6	5	5	6	5	4	4	4	3	1	58	−1	57
Teapot	40	39	42	39	38	36	35	34	33	29	30	31	426	------	426
Other	1	1	3	2	2	13	3	3	4	7	2	2	43	26	69
	2,468	2,229	2,372	2,226	2,225	2,170	2,107	2,045	2,039	1,944	1,911	1,804	25,540	236	25,776
1927															
Big Muddy	87	83	92	89	89	87	90	97	92	93	89	85	1,073	−1	1,072
Elk Basin	23	24	27	25	29	27	28	32	30	33	32	27	337	------	337
Grass Creek	84	75	86	78	79	84	84	83	81	84	81	77	976	−2	974
Hamilton Dome	-----	-----	35	41	31	35	44	30	29	29	14	18	306	2	308
La Barge	8	8	9	16	19	19	30	37	29	28	52	71	326	15	341
Lance Creek	23	21	21	18	16	18	19	17	41	36	19	18	267	2	269
Lander-Dallas	18	14	14	14	17	17	18	18	23	30	28	28	239	7	246
Lost Soldier-Ferris	161	125	136	135	109	44	152	127	108	104	103	132	1,436	−95	1,341
Mule Creek	-----	-----	-----	-----	39	30	21	23	20	19	19	17	188	------	188
Osage	9	10	9	9	10	9	8	9	9	10	10	7	109	−2	107
Poison Spider-South Casper	29	23	25	23	22	22	26	25	18	19	11	4	247	------	247
Rex Lake	6	5	5	6	4	3	3	4	5	3	-----	-----	44	------	44
Rock Creek	82	81	88	85	82	82	85	82	82	79	76	77	981	1	982
Salt Creek	1,312	1,195	1,289	1,294	1,340	1,267	1,318	1,109	984	1,004	1,065	1,228	14,405	−6	14,399
Teapot	28	25	31	25	29	26	28	28	24	27	21	22	314	------	314
Other	4	3	4	6	8	8	15	13	25	15	4	2	107	31	138
	1,874	1,692	1,871	1,864	1,923	1,778	1,969	1,734	1,600	1,613	1,624	1,813	21,355	−48	21,307

Other States.—Although the low prices for crude were particularly severe on the operators in the eastern and central fields, the total production of nine States included in the area showed an increase for the third successive year. This increase primarily was a result of the growth in use of artificial methods, such as water flooding and repressing in the Bradford district of Pennsylvania and New York, and from greater efficiency in operation—virtually a necessity if a profit was to be shown.

As stated above, activity in Pennsylvania and New York centered around the expansion in use of water flooding which enabled these two States to again show a material increase in annual output.

Although nothing of particular interest occurred in Ohio in 1927, the total output was 4.4 per cent more than in 1926. The increased production was an adjunct to an unusual amount of drilling for gas, as well as a result of careful operation.

Illinois had a particularly dull year in 1927, and the output of the State showed a decline from 1926. This decrease, the only one recorded for any of the nine States, allowed Ohio to outrank Illinois as an oil-producing State for the first time since 1906.

Nothing of importance developed in eastern Kentucky in 1927, but western Kentucky experienced a considerable boom, following the discovery of several new pools. Most of the increased production came from Ohio County, in which the output was nearly 1,000,000 barrels more than that of 1926.

Wildcatting in Tennessee was fairly successful in 1927; although the output was about 40 per cent higher than that of 1926, development work was still hampered by lack of transportation facilities.

Michigan produced 439,000 barrels of crude petroleum in 1927 as compared with 94,000 in 1926. The Saginaw field, which produced virtually the whole of the State total, was actively developed during 1927. At the close of the year, however, production had declined. Considerable wildcatting was done over most of the State, and several discoveries were made, the most important of which was made late in the year near Muskegon in the western part of the State.

Petroleum produced in other States in 1927

[Thousands of barrels of 42 U. S. gallons]

State	Rank	Production	Percentage of increase or decrease from 1926	State	Rank	Production	Percentage of increase or decrease from 1926
Pennsylvania	8	9,526	+6.3	Indiana	17	852	+5.4
Ohio	9	7,593	+4.4	Michigan	18	439	+367.0
Illinois	10	6,994	−9.9	Tennessee	19	60	+39.5
Kentucky	11	6,719	+7.1				
West Virginia	12	6,023	+1.3		--------	40,448	+3.4
New York	15	2,242	+14.6				

Petroleum produced in Pennsylvania, 1925–1927, by counties, in barrels[1]

County	1925	1926	1927	County	1925	1926	1927
Allegheny	453,648	422,797	406,771	McKean	[2] 2,575,089	[2] 2,962,698	[2] 3,373,708
Armstrong	20,093	19,718	19,420	Mercer	13,804	14,401	14,031
Beaver	83,908	84,296	81,198	Potter	11,686	7,395	6,860
Butler	846,151	689,782	666,976	Tioga	5,916	2,441	----------
Clarion	208,807	209,965	190,365	Venango	1,184,221	1,161,924	1,196,901
Crawford	57,637	64,523	75,235	Warren	294,597	313,808	343,192
Elk	93,546	88,419	86,213	Washington	455,554	449,493	455,808
Forest	131,162	137,078	127,814	Westmoreland	186	----------	86
Greene	302,938	439,576	370,613				
Jefferson	8,527	21,167	7,687		[2] 6,770,007	[2] 7,108,829	[2] 7,440,177
Lawrence	22,537	19,348	17,299	Bureau of Mines	[2] 8,097,000	[2] 8,961,000	[2] 9,526,000

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[1] Department of Internal Affairs, Pennsylvania.

[2] Differences in totals due mainly to differences in production recorded for McKean County.

Petroleum produced in Kentucky, 1925–1927, by counties, in barrels [1]

County	1925	1926	1927	County	1925	1926	1927
Allen	304, 579	280, 228	254, 745	Logan	564	661	433
Barren	253, 561	341, 812	362, 510	Magoffin	890, 117	780, 901	706, 256
Bath	16, 805	14, 872	12, 372	Martin	3	11	19
Boyd	992	712	783	McCreary	3, 751	6, 418	9, 537
Clinton	11, 031	11, 894	44, 336	Menifee	1, 936	1, 573	1, 613
Cumberland	69, 805	45, 317	55, 432	Monroe	22, 621	6, 788	3, 857
Daviess	12, 321	22, 487	48, 925	Morgan	8, 148	6, 999	6, 356
Elliott	8, 240	9, 727	9, 278	Ohio	165, 040	362, 909	1, 326, 055
Estill	436, 483	401, 876	374, 772	Owsley	16, 167	13, 605	19, 976
Floyd	7, 873	13, 494	7, 187	Powell	212, 582	172, 688	146, 546
Hancock	33, 578	30, 999	22, 665	Russell	1, 917	----------	----------
Hopkins	15, 073	14, 692	11, 305	Simpson	8, 953	7, 089	5, 268
Jackson	583	1, 239	1, 175	Warren	489, 646	408, 807	320, 587
Johnson	1, 026, 322	968, 284	862, 909	Wayne	134, 142	108, 229	90, 844
Knott	2, 634	1, 876	2, 022	Wolfe	52, 538	53, 969	54, 644
Lawrence	665, 795	688, 124	631, 420				
Lee	1, 775, 004	1, 449, 526	1, 248, 195		6, 648, 854	6, 227, 806	6, 642, 022
Lincoln	50	----------	----------	Bureau of Mines	6, 759, 000	6, 274, 000	6, 719, 000

[1] Kentucky State Tax Commission.

WORLD PRODUCTION

The world production of crude petroleum in 1927 amounted to 1,261,073,000 barrels, an increase over 1926 of 164,186,000 barrels, or 15 per cent. This increase was the largest ever recorded for any year and was due largely to the increased output of the United States, although a number of other countries made larger percentage gains in output. The United States continued to produce over 70 per cent of the world total; Russia ranked second, producing 6 per cent. The output of Mexico declined materially, and that of Russia increased moderately; as a result Russia took second place for the first time since 1917. Production in Venezuela continued its rapid increase; the total for the year was only about a million barrels less than that of Mexico.

Russia.—As already stated, Russia displaced Mexico and ranked second as a producing nation. The total output was 77,018,000 barrels, an increase of 12,707,000 barrels over 1926. The most important factors in this increase were a gain of 6,500,000 barrels in the Surakhani pool of the Baku district and increased output in the Grozny region.

Mexico.—The overproduction of crude petroleum in the United States and the continued uncertainty regarding the petroleum laws in Mexico retarded the production of crude petroleum in that country in 1927; consequently the total output again declined materially, particularly in the heavy-oil or northern fields, in the Pánuco district. On the other hand, several of the pools in the light-oil or southern fields made gains over 1926. The only new field to develop production of importance was Jardin-Paso Real, in the light-oil region.

Venezuela.—Production in Venezuela in 1927 amounted to 63,134,000 barrels, as compared with 36,911,000 barrels in 1926. These figures represent an increase of 71 per cent, the largest relative increase for any of the major producing countries with the exception of Colombia. The output of the Lagunillas field in 1927 was 28,826,000 barrels, as compared with 1,177,000 barrels in 1926; to this field may be laid the credit for the increase of the country as a whole.

Persia and Rumania.—Production in both Persia and Rumania showed small increases, although they retained fifth and sixth place, respectively, among the producing countries.

World's production of crude petroleum,

[Thousands of barrels

Year	Rumania	United States	Italy	Canada	Russia [1]	Poland (Galicia)	Japan and Taiwan	Germany	India	Netherland East Indies	Peru	Mexico	Argentina
1857-60	19	502	(3)	------	---------	-------	------	------	------	------	------	---------	------
1861	17	2, 114	(3)	------	---------	-------	------	------	------	------	------	---------	------
1862	23	3, 057	(3)	12	---------	-------	------	------	------	------	------	---------	------
1863	28	2, 611	(3)	83	41	-------	------	------	------	------	------	---------	------
1864	33	2, 116	(3)	90	65	-------	------	------	------	------	------	---------	------
1865	39	2, 498	2	110	67	-------	------	------	------	------	------	---------	------
1866	42	3, 598	1	175	83	-------	------	------	------	------	------	---------	------
1867	51	3, 347	1	190	120	-------	------	------	------	------	------	---------	------
1868	56	3, 646	(3)	200	88	-------	------	------	------	------	------	---------	------
1869	59	4, 215	(3)	220	202	-------	------	------	------	------	------	---------	------
1870	84	5, 261	(3)	250	204	-------	------	------	------	------	------	---------	------
1871	90	5, 205	(3)	270	165	-------	------	------	------	------	------	---------	------
1872	91	6, 293	(3)	308	185	-------	------	------	------	------	------	---------	------
1873	104	9, 894	(3)	365	475	-------	------	------	------	------	------	---------	------
1874	103	10, 927	1	169	583	150	------	------	------	------	------	---------	------
1875	108	8, 788	1	220	697	158	5	------	------	------	------	---------	------
1876	111	9, 133	3	312	1, 321	164	7	------	------	------	------	---------	------
1877	108	13, 350	3	312	1, 801	170	10	------	------	------	------	---------	------
1878	109	15, 397	4	312	2, 401	176	18	------	------	------	------	---------	------
1879	110	19, 914	3	575	2, 761	215	23	------	------	------	------	---------	------
1880	115	26, 286	2	350	3, 001	229	26	9	------	------	------	---------	------
1881	122	27, 661	1	275	3, 601	287	17	29	------	------	------	---------	------
1882	136	30, 350	2	275	4, 538	330	15	58	------	------	------	---------	------
1883	139	23, 450	2	250	6, 002	365	20	27	------	------	------	---------	------
1884	211	24, 218	3	250	10, 805	408	28	46	------	------	------	---------	------
1885	193	21, 859	2	250	13, 925	465	30	41	------	------	------	---------	------
1886	168	28, 065	2	584	18, 006	306	38	74	------	------	------	---------	------
1887	182	28, 283	1	526	18, 368	344	29	74	------	------	------	---------	------
1888	219	27, 612	1	695	23, 049	467	37	85	------	------	------	---------	------
1889	298	35, 164	1	705	24, 609	515	53	68	94	------	------	---------	------
1890	383	45, 824	3	795	28, 691	659	52	108	118	------	------	---------	------
1891	488	54, 293	8	755	34, 573	631	53	109	190	------	------	---------	------
1892	593	50, 515	18	780	35, 775	646	69	101	242	------	------	---------	------
1893	535	48, 431	19	798	40, 457	693	106	100	299	600	------	---------	------
1894	508	49, 344	21	829	36, 375	949	173	123	327	688	------	---------	------
1895	576	52, 892	26	726	46, 140	1, 453	170	121	372	1, 216	------	---------	------
1896	543	60, 960	18	727	47, 221	2, 444	237	145	430	1, 427	47	---------	------
1897	571	60, 476	14	710	54, 399	2, 226	262	166	546	2, 552	71	---------	------
1898	776	55, 364	15	758	61, 610	2, 376	319	184	542	2, 964	71	---------	------
1899	1, 426	57, 071	16	808	65, 955	2, 314	539	192	941	1, 796	89	---------	------
1900	1, 629	63, 621	12	913	75, 780	2, 347	871	358	1, 079	2, 253	274	---------	------
1901	1, 678	69, 389	16	757	85, 168	3, 251	1, 117	314	1, 431	4, 014	275	10	------
1902	2, 060	88, 767	19	531	80, 540	4, 142	996	354	1, 617	2, 430	287	40	------
1903	2, 763	100, 461	18	487	75, 591	5, 235	1, 209	446	2, 510	5, 770	278	75	------
1904	3, 599	117, 081	26	553	78, 537	5, 947	1, 219	637	3, 385	6, 508	290	126	------
1905	4, 421	134, 717	44	634	54, 960	5, 766	1, 347	561	4, 137	7, 850	373	251	------
1906	6, 378	126, 494	54	569	58, 897	5, 468	1, 564	579	4, 016	8, 181	531	502	------
1907	8, 118	166, 095	60	789	61, 851	8, 456	1, 718	757	4, 344	9, 983	751	1, 005	(3)
1908	8, 252	178, 527	51	528	62, 187	12, 612	1, 871	1, 009	5, 047	10, 283	945	3, 933	12
1909	9, 327	183, 171	42	421	65, 970	14, 933	1, 887	1, 019	6, 677	11, 042	1, 411	2, 714	18
1910	9, 724	209, 557	51	316	70, 337	12, 673	1, 829	1, 032	6, 138	11, 031	1, 258	3, 634	20
1911	11, 108	220, 449	75	291	66, 184	10, 519	1, 737	1, 017	6, 451	12, 173	1, 465	12, 553	13
1912	12, 976	222, 935	54	243	68, 019	8, 535	1, 659	1, 031	7, 117	10, 846	1, 752	16, 558	47
1913	13, 555	248, 446	47	228	62, 834	7, 818	1, 940	857	7, 930	11, 172	2, 071	25, 696	131
1914	12, 827	265, 763	40	215	67, 020	6, 436	2, 636	781	7, 410	11, 422	1, 837	26, 235	276
1915	12, 030	281, 104	44	215	68, 548	5, 352	2, 928	703	8, 202	11, 920	2, 579	32, 911	513
1916	8, 945	300, 767	51	198	65, 817	6, 587	2, 963	656	8, 491	12, 547	2, 593	40, 546	867
1917	3, 721	335, 316	41	214	63, 072	6, 228	2, 861	642	8, 079	13, 180	2, 577	55, 293	1, 218
1918	8, 730	355, 928	35	305	27, 168	6, 032	2, 441	270	8, 188	12, 778	2, 527	63, 828	1, 353
1919	6, 618	378, 367	35	241	31, 752	6, 096	2, 238	265	8, 736	15, 508	2, 628	87, 073	1, 331
1920	7, 435	442, 929	35	196	25, 430	5, 607	2, 221	246	8, 375	17, 529	2, 817	157, 069	1, 651
1921	8, 368	472, 183	32	188	28, 968	5, 167	2, 233	274	8, 734	16, 958	3, 699	193, 398	2, 036
1922	9, 843	557, 531	31	179	35, 692	5, 227	2, 055	319	8, 529	17, 066	5, 314	182, 278	2, 866
1923	10, 867	732, 407	34	170	39, 147	5, 402	1, 804	346	8, 406	19, 870	5, 699	149, 585	3, 400
1924	13, 369	713, 940	39	161	45, 355	5, 657	1, 814	406	8, 416	20, 473	8, 379	139, 678	4, 639
1925	16, 650	763, 743	61	332	52, 448	5, 960	1, 915	541	8, 274	21, 422	9, 252	115, 515	6, 336
1926	23, 314	770, 874	41	364	64, 311	5, 844	1, 785	653	8, 011	21, 243	10, 519	90, 421	7, 851
1927	26, 368	901, 129	44	477	77, 018	5, 342	1, 700	663	7, 878	25, 967	10, 135	64, 121	8, 630
	274, 240	10, 341, 675	1, 326	26, 734	2, 246, 960	207, 779	54, 894	18, 596	181, 709	362, 662	82, 794	1, 465, 048	43, 208

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[1] Exclusive of Sakhalin, which is shown separately.

[2] Estimated.

1857–1927, by years and countries

of 42 U. S. gallons]

Trinidad	Egypt	Persia	Sarawak	Algeria	Ecuador	Venezuela	France	England	Czechoslovakia	Sakhalin (Russian)	Colombia	Other countries [2]	Total	Percentage produced by United States
------	------	------	------	------	------	------	------	------	------	------	------	------	521	96
------	------	------	------	------	------	------	------	------	------	------	------	------	2,131	99
------	------	------	------	------	------	------	------	------	------	------	------	------	3,092	99
------	------	------	------	------	------	------	------	------	------	------	------	------	2,763	94
------	------	------	------	------	------	------	------	------	------	------	------	------	2,304	92
------	------	------	------	------	------	------	------	------	------	------	------	------	2,716	92
------	------	------	------	------	------	------	------	------	------	------	------	------	3,899	92
------	------	------	------	------	------	------	------	------	------	------	------	------	3,709	90
------	------	------	------	------	------	------	------	------	------	------	------	------	3,990	91
------	------	------	------	------	------	------	------	------	------	------	------	------	4,696	90
------	------	------	------	------	------	------	------	------	------	------	------	------	5,799	91
------	------	------	------	------	------	------	------	------	------	------	------	------	5,730	91
------	------	------	------	------	------	------	------	------	------	------	------	------	6,877	92
------	------	------	------	------	------	------	------	------	------	------	------	------	10,838	91
------	------	------	------	------	------	------	------	------	------	------	------	------	11,933	92
------	------	------	------	------	------	------	------	------	------	------	------	------	9,977	88
------	------	------	------	------	------	------	------	------	------	------	------	------	11,051	83
------	------	------	------	------	------	------	------	------	------	------	------	------	15,754	85
------	------	------	------	------	------	------	------	------	------	------	------	------	18,417	84
------	------	------	------	------	------	------	------	------	------	------	------	------	23,601	84
------	------	------	------	------	------	------	------	------	------	------	------	------	30,018	88
------	------	------	------	------	------	------	------	------	------	------	------	------	31,993	86
------	------	------	------	------	------	------	------	------	------	------	------	------	35,704	85
------	------	------	------	------	------	------	------	------	------	------	------	------	30,255	78
------	------	------	------	------	------	------	------	------	------	------	------	------	35,969	67
------	------	------	------	------	------	------	------	------	------	------	------	------	36,765	59
------	------	------	------	------	------	------	------	------	------	------	------	------	47,243	59
------	------	------	------	------	------	------	------	------	------	------	------	------	47,807	59
------	------	------	------	------	------	------	------	------	------	------	------	------	52,165	53
------	------	------	------	------	------	------	------	------	------	------	------	------	61,507	57
------	------	------	------	------	------	------	------	------	------	------	------	------	76,633	60
------	------	------	------	------	------	------	------	------	------	------	------	------	91,100	60
------	------	------	------	------	------	------	------	------	------	------	------	------	88,739	57
------	------	------	------	------	------	------	------	------	------	------	------	------	92,038	53
------	------	------	------	------	------	------	------	------	------	------	------	------	89,337	55
------	------	------	------	------	------	------	------	------	------	------	------	------	103,692	51
------	------	------	------	------	------	------	------	------	------	------	------	------	114,199	53
------	------	------	------	------	------	------	------	------	------	------	------	------	121,993	50
------	------	------	------	------	------	------	------	------	------	------	------	------	124,979	44
------	------	------	------	------	------	------	------	------	------	------	------	------	131,147	44
------	------	------	------	------	------	------	------	------	------	------	------	------	149,137	43
------	------	------	------	------	------	------	------	------	------	------	------	20	167,440	41
------	------	------	------	------	------	------	------	------	------	------	------	26	181,809	49
------	------	------	------	------	------	------	------	------	------	------	------	36	194,879	52
------	------	------	------	------	------	------	------	------	------	------	------	40	217,948	54
------	------	------	------	------	------	------	------	------	------	------	------	30	215,091	63
------	------	------	------	------	------	------	------	------	------	------	------	30	213,263	59
------	------	------	------	------	------	------	------	------	------	------	------	30	263,957	63
(3)	------	------	------	------	------	------	------	------	------	------	------	30	285,287	63
57	------	------	------	------	------	------	------	------	------	------	------	20	298,709	61
143	------	------	------	------	------	------	------	------	------	------	------	20	327,763	64
285	21	------	------	------	------	------	------	------	------	------	------	20	344,361	64
437	214	------	------	------	------	------	------	------	------	------	------	20	352,443	63
504	98	1,857	141	------	------	------	------	------	------	------	------	20	385,345	64
644	753	2,910	318	1	------	------	------	------	------	------	------	20	407,544	65
750	212	3,616	392	4	------	------	------	------	------	------	------	10	432,033	65
929	404	4,477	629	8	------	------	------	------	------	------	------	25	457,500	66
1,602	943	7,147	542	9	57	120	------	------	------	------	------	29	502,891	67
2,082	1,935	8,623	504	7	[2] 60	333	[4] 363	------	------	------	------	25	503,515	71
1,841	1,517	10,139	596	5	[2] 60	425	334	2	48	------	------	20	555,875	68
2,083	1,042	12,230	1,020	4	[2] 60	457	356	3	69	------	------	20	688,884	64
2,354	1,255	16,673	1,411	3	[2] 60	1,433	389	3	94	2	------	20	765,935	62
2,445	1,188	22,247	2,849	9	[2] 60	2,201	496	1	120	7	323	22	858,898	65
3,051	1,054	25,230	3,940	9	87	4,201	494	1	74	9	424	24	1,015,735	72
4,057	1,122	32,373	4,163	11	[2] 100	9,042	497	2	76	80	445	24	1,014,318	70
4,387	1,226	35,038	4,257	12	160	19,687	459	3	158	87	1,007	23	1,068,953	71
5,278	1,188	35,842	4,942	9	214	36,911	478	2	150	181	6,444	17	1,096,887	70
5,712	1,267	39,688	4,943	8	537	63,134	504	2	149	440	15,002	215	1,261,073	71
38,641	15,439	258,090	30,647	99	1,455	137,944	4,370	19	938	806	23,645	836	15,820,554	65

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[3] Less than 1,000.

[4] Production in previous years credited to Germany.

World production of petroleum in 1927, by countries, compared with 1926

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1927				1926			
	Thousands of barrels of 42 U. S. gallons	Thousands of metric tons	Thousands of cubic meters	Percentage of total by volume	Thousands of barrels of 42 U. S. gallons	Thousands of metric tons	Thousands of cubic meters	Percentage of total by volume
United States	901, 129	123, 486	143, 264	71. 5	770, 874	106, 474	122, 555	70. 3
Russia [1]	77, 018	10, 554	12, 245	6. 1	64, 311	8, 899	10, 224	5. 9
Mexico	64, 121	9, 728	10, 194	5. 1	90, 421	13, 758	14, 375	8. 2
Venezuela	63, 134	9, 384	1, 004	5. 0	36, 911	5, 207	5, 868	3. 4
Persia	39, 688	5, 326	6, 310	3. 1	35, 842	4, 759	5, 698	3. 3
Rumania	26, 368	3, 669	4, 192	2. 1	23, 314	3, 244	3, 707	2. 1
Netherland East Indies	25, 967	3, 694	4, 128	2. 1	21, 243	3, 018	3, 377	1. 9
Colombia	15, 002	2, 142	2, 385	1. 2	6, 444	920	1, 024	. 6
Peru	10, 135	1, 341	1, 611	. 8	10, 519	1, 395	1, 672	1. 0
Argentina	8, 630	1, 254	1, 372	. 7	7, 851	1, 143	1, 248	. 7
India, British	7, 878	1, 106	1, 252	. 6	8, 011	1, 125	1, 274	. 7
Trinidad	5, 712	797	908	. 5	5, 278	737	839	. 5
Poland	5, 342	723	849	. 4	5, 844	796	929	. 5
British Borneo—Sarawak	4, 943	712	786	. 4	4, 942	712	786	. 4
Japan and Taiwan	1, 700	236	270	. 1	1, 785	248	284	. 2
Egypt	1, 267	185	201	. 1	1, 188	173	189	. 1
Germany	663	97	105	. 2	653	95	104	. 2
Ecuador	537	76	85		214	30	34	
France	504	73	80		478	68	76	
Canada	477	60	76		364	46	58	
Sakhalin, Russian	440	69	70		181	28	29	
Czechoslovakia	149	22	24		150	22	24	
Italy	44	6	7		41	5	7	
Algeria	8	30	36		9	4	5	
Cuba	3				2			
England	2				2			
Other countries [2]	[3] 212				15			
	1, 261, 073	174, 770	191, 454	100. 0	1, 096, 887	152, 906	174, 386	100. 0

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[1] Exclusive of Sakhalin, which is shown separately.
[2] Estimated.
[3] Includes estimated production in the Baba-Gurgur field, Iraq.

PRODUCTION OF PETROLEUM IN FOREIGN COUNTRIES IN 1927, BY FIELDS

Petroleum produced in certain foreign countries in 1927, by provinces, districts, or fields

[Compiled by L. M. Jones, of the Bureau of Mines]

	Barrels of 42 U. S. gallons	Metric tons
Argentina:		
Comodoro Rivadavia	8, 094, 997	1, 181, 060
Plaza Huincul	516, 170	69, 941
Other fields	18, 480	2, 690
	8, 629, 647	1, 253, 691
Canada:		
Alberta	318, 741	38, 472
New Brunswick	18, 244	2, 423
Ontario—		
Bothwell	25, 223	3, 448
Oil springs	37, 281	5, 003
Petrolia and Enniskillen	59, 423	8, 278
Other fields	17, 679	2, 417
	476, 591	60, 041
Egypt:		
Abu-Durba	8, 226	1, 272
Gemsah	1, 299	170
Hurghada	1, 257, 261	183, 114
	1, 266, 786	184, 556
France:		
Alsace (Pechelbronn)	473, 424	68, 642
Gabian	30, 234	4, 028
	503, 658	72, 670
Germany:		
Hildesheim	33, 315	4, 867
Lüneburg	629, 850	92, 016
Other fields	144	21
	663, 309	96, 904
Italy:		
Abruzzi—Chieti	285	44
Emilia—		
Parma	8, 507	1, 190
Piacenza	28, 527	3, 666
Valle Latina—Caserta	7, 026	1, 238
	44, 345	6, 138

Petroleum produced in certain foreign countries in 1927, by provinces, districts, or fields—Continued

	Barrels of 42 U. S. gallons	Metric tons
Mexico:		
Heavy oil—		
Altamira	381, 602	59, 339
Ebano	13, 319, 314	2, 076, 481
El Limon	569, 389	88, 084
Panuco—		
Cacalilao	11, 830, 219	1, 839, 599
Other	11, 237, 626	1, 747, 451
San Jeronimo	152, 218	23, 518
Topila	1, 483, 201	227, 078
	38, 973, 569	6, 061, 550
Light oil—		
Alazan	287, 661	41, 941
Belen	2, 793	368
Cerro Viejo	845, 452	122, 760
Chiconcillo y San Miguel	149, 954	22, 058
Concepcion	15, 549	2, 270
Dos Bocas	79, 267	11, 573
Filisola	2, 683, 169	377, 254
Furbero	114, 327	16, 292
Isleta de Capoacan	9, 083	1, 326
Jardin-Paso Real	2, 022, 172	295, 237
Potrero del Llano	573, 585	83, 686
San Isidro	42, 017	6, 134
Sarlat	76	10
Tecuanapa	6, 862	1, 002
Tepetate, Chinampa, Amatlan, Zacamixtle	6, 612, 564	969, 402
Tierra Amarilla	55, 270	8, 075
Tierra Blanca, Chapapote, Alamo	4, 403, 088	643, 291
Toteco, Cerro Azul	7, 244, 684	1, 064, 244
	25, 147, 573	3, 666, 923
	64, 121, 142	9, 728, 473
Netherland East Indies:		
Borneo	16, 546, 655	2, 447, 368
Ceram	258, 714	37, 225
Java	2, 235, 824	308, 645
Sumatra	6, 925, 829	900, 628
	25, 967, 022	3, 693, 866
Persia—Masjid-i-Suleiman	39, 687, 539	5, 325, 880
Peru:		
La Brea-Parinas	7, 768, 140	1, 028, 867
Lobitos Restin	2, 284, 970	300, 986
Zorritos	81, 861	10, 744
	10, 134, 971	1, 340, 597
Poland:		
Cracow	64	9
Drohobycz	4, 502, 538	609, 192
Jaslo	538, 860	72, 652
Stanislaw	300, 480	40, 743
	5, 341, 942	722, 596
Rumania:		
Bacau	479, 795	66, 768
Buzau	831, 320	115, 686
Dambovitza	7, 264, 974	1, 010, 990
Maramures	43	6
Prahova	17, 791, 846	2, 475, 904
	26, 367, 978	3, 669, 354
Russia:[1]		
Baku—		
Balakhani	5, 926, 270	875, 243
Bibi-Eibat	11, 332, 687	1, 564, 424
Binagadi	2, 544, 834	370, 913
Ramani	7, 443, 372	1, 008, 587
Sabunchi	7, 019, 766	973, 401
Surakhani	17, 076, 983	2, 140, 241
Undistributed	620, 097	88, 560
	51, 964, 009	7, 021, 369
Cheleken Island	59, 289	8, 417
Emba-Ural	1, 790, 874	265, 079
Ferghana	161, 502	22, 039
Grozny	22, 494, 179	3, 155, 749
Kuban-Black Sea	548, 425	81, 176
	77, 018, 278	10, 553, 829
Sakhalin—Okha	439, 955	68, 700
Venezuela:		
Maracaibo Basin—		
Ambrosio	272, 323	39, 269
Benitez	1, 146, 278	163, 115
Concepcion	633, 782	88, 983
El Mene	2, 475, 084	333, 397
Lagunillas	28, 825, 576	4, 341, 133
La Paz	228, 910	33, 679
La Rosa	19, 309, 649	2, 836, 583
Mene Grande	9, 818, 296	1, 482, 564
Rio Oro and Rio Tarra	107, 188	15, 342
Eastern Venezuela—		
Guanoco	317, 192	50, 338
	63, 134, 278	9, 384, 403

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[1] Exclusive of Sakhalin.

IMPORTS AND EXPORTS

Imports of crude petroleum into the United States in 1927 amounted to 58,383,000 barrels, valued at $78,609,000, a slight decrease in both quantity and value from 1926. The continued decline in the Mexican fields was again reflected in a material decrease in imports from that country. Imports from Mexico in 1927 amounted to 26,019,000 barrels, or 45 per cent of the total imports, whereas the imports of Mexican oil in 1926 amounted to 40,398,000 barrels, or 67 per cent of the total. These figures indicate the decreasing importance of Mexico as a source of supply. On the other hand, imports from Colombia and Venezuela combined amounted to 29,522,000 barrels in 1927, or almost double the 1926 figure. Approximately one-third of the total production in Venezuela and over half of the output of Colombia in 1927 was exported to the United States. These proportions were about the same as those of 1926.

Receipts of foreign oil at the Gulf ports fell off materially, while those at Atlantic ports increased. This was partly due to the overproduction of domestic grades in the Mid-Continent, a large part of which was shipped by pipe line to the Gulf.

Exports of domestic crude petroleum from the United States in 1927 amounted to 15,843,000 barrels, valued at $25,944,000, a small increase in quantity but a decrease in value in comparison with 1926. Canada continued to import the major part of our exports, with Japan again second. Exports to the latter country in 1927 showed a material increase. Spain imported 118,000 barrels of crude petroleum from the United States in 1927, the first material amount ever recorded.

Crude petroleum imported, exported, and shipped to Territories, 1923–1927

[Barrels of 42 U. S. gallons]

Year	Imports		Exports (including foreign crude oil)		Shipments from United States to Territories						Total of exports and shipments to Territories
					Alaska		Hawaii		Porto Rico		
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value	Barrels
1923	82, 015, 025	$53, 882, 259	17, 385, 378	$23, 262, 190	2, 741	$13, 713	146, 482	$161, 198	-----	------	17, 534, 601
1924	77, 775, 173	73, 841, 507	17, 972, 539	26, 660, 412	204	1, 008	265, 600	275, 600	179	$1, 060	18, 238, 522
1925	61, 824, 242	75, 406, 956	13, 335, 107	24, 369, 277	124	232	1, 429	7, 200	-----	------	13, 336, 660
1926	60, 382, 329	79, 307, 877	15, 407, 398	28, 500, 209	496	2, 743	-------	--------	-----	------	15, 407, 894
1927	58, 382, 632	78, 609, 117	15, 843, 646	25, 944, 822	-- --	-------	-------	--------	-----	------	15, 843, 646

Crude petroleum imported and exported, 1926–27, by months

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year	
													Thousands of barrels	Value (thousands of dollars)
1926														
Imports:														
By countries—														
Colombia	-----	-----	-----	-----	-----	-----	367	549	653	230	905	917	3, 621	7, 264
Mexico	3, 496	2, 883	5, 362	4, 405	3, 344	4, 215	3, 399	3, 360	2, 265	2, 500	2, 916	2, 253	40, 398	46, 778
Peru	370	120	440	390	304	278	306	235	267	119	-----	215	3, 044	7, 029
Venezuela [1]	759	740	1, 114	1, 111	853	1, 009	1, 037	1, 088	1, 102	834	1, 066	1, 572	12, 285	16, 560
Other countries	63	-----	300	-----	-----	69	76	100	63	177	156	30	1, 034	1, 677
	4, 688	3, 743	7, 216	5, 906	4, 501	5, 571	5, 185	5, 332	4, 350	3, 860	5, 043	4, 987	60, 382	79, 308
By ports of entry—														
Atlantic coast	3, 412	1, 962	4, 966	3, 521	2, 821	3, 630	3, 705	3, 266	3, 585	2, 155	3, 112	3, 470	39, 605	54, 749
Gulf coast	1, 276	1, 781	2, 248	2, 385	1, 680	1, 941	1, 479	2, 066	763	1, 705	1, 931	1, 517	20, 772	24, 553
Northern border	-----	-----	2	-----	-----	-----	1	-----	2	-----	-----	-----	5	6
	4, 688	3, 743	7, 216	5, 906	4, 501	5, 571	5, 185	5, 332	4, 350	3, 860	5, 043	4, 987	60, 382	79, 308

[1] Includes imports recorded by Bureau of Foreign and Domestic Commerce as from Netherland West Indies.

Crude petroleum imported and exported, 1926–27, by months—Continued

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year	
													Thousands of barrels	Value (thousands of dollars)
1926—Continued														
Exports:														
By countries—														
Domestic crude oil—														
Argentina	-----	89	-----	-----	102	36	-----	-----	-----	-----	-----	-----	227	431
Canada	1, 058	780	821	971	1, 383	1, 068	1, 537	960	1, 234	920	1, 101	1, 150	12, 983	24, 281
Cuba	53	-----	54	115	53	53	-----	-----	-----	53	53	-----	434	1, 177
Japan	70	108	71	177	200	66	185	60	151	-----	175	72	1, 335	1, 536
Mexico	2	1	2	4	2	1	2	1	2	2	12	8	39	65
United Kingdom	-----	-----	-----	-----	62	2	-----	-----	-----	-----	1	-----	65	98
Other countries	-----	71	16	41	40	-----	2	62	1	35	2	53	323	908
Foreign crude oil	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	4
	1, 183	1, 049	965	1, 308	1, 842	1, 226	1, 726	1, 083	1, 388	1, 010	1, 344	1, 283	15, 407	28, 500
By ports—														
Atlantic coast	-----	30	-----	42	2	-----	-----	-----	1	35	-----	-----	110	348
Gulf coast	107	125	70	114	255	80	31	62	-----	200	55	-----	1, 099	2, 509
Mexican border	2	1	2	4	1	1	1	1	2	2	12	7	36	65
Northern border	850	625	594	574	780	731	934	727	717	616	854	811	8, 813	18, 345
Pacific coast	224	268	299	574	804	414	760	293	668	157	423	465	5, 349	7, 233
	1, 183	1, 049	965	1, 308	1, 842	1, 226	1, 726	1, 083	1, 388	1, 010	1, 344	1, 283	15, 407	28, 500
Excess of imports over exports	3, 505	2, 694	6, 251	4, 598	2, 659	4, 345	3, 459	4, 249	2, 962	2, 850	3, 699	3, 704	44, 975	50, 808
1927														
Imports:														
By countries—														
Colombia	839	585	856	591	625	180	542	381	764	797	727	1, 075	7, 962	13, 559
Mexico	2, 040	1, 771	1, 651	1, 947	2, 749	2, 733	2, 825	3, 375	2, 234	1, 503	1, 864	1, 327	26, 019	30, 443
Peru	212	-----	421	338	120	120	48	240	288	-----	-----	100	1, 887	4, 157
Venezuela[1]	1, 400	1, 752	1, 625	1, 055	1, 031	896	1, 308	2, 215	1, 759	2, 260	2, 748	3, 511	21, 560	29, 174
Other countries	102	73	29	132	32	90	100	50	77	73	-----	197	955	1, 276
	4, 593	4, 181	4, 582	4, 063	4, 557	4, 019	4, 823	6, 261	5, 122	4, 633	5, 339	6, 210	58, 383	78, 609
By ports of entry—														
Atlantic coast	3, 161	2, 816	3, 428	3, 482	3, 661	3, 428	3, 877	5, 649	4, 640	4, 049	4, 571	5, 719	48, 481	66, 869
Gulf coast	1, 432	1, 365	1, 154	581	890	586	937	612	482	584	768	491	9, 882	11, 694
Mexican border	-----	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	3	4
Northern border	-----	-----	-----	-----	6	5	6	-----	-----	-----	-----	-----	17	42
	4, 593	4, 181	4, 582	4, 063	4, 557	4, 019	4, 823	6, 261	5, 122	4, 633	5, 339	6, 210	58, 383	78, 609
Exports:														
By countries—														
Domestic crude oil—														
Canada	968	884	1, 043	1, 020	1, 117	1, 191	894	1, 200	1, 038	1, 271	998	1, 412	13, 036	21, 579
Cuba	107	70	54	-----	54	-----	53	65	-----	71	53	-----	527	1, 303
Germany	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	64	94	158	262
Japan	125	164	69	119	117	164	138	82	247	74	127	208	1, 634	1, 906
Mexico	4	2	2	30	8	2	4	2	1	3	3	3	64	115
New Zealand	-----	-----	-----	-----	-----	6	-----	-----	11	79	-----	-----	96	114
Spain	-----	-----	29	-----	-----	48	-----	-----	-----	41	-----	-----	118	183
United Kingdom	-----	-----	-----	-----	69	-----	-----	-----	-----	-----	-----	-----	69	142
Other countries	-----	45	2	2	25	-----	-----	33	-----	-----	35	-----	142	341
Foreign crude oil	-----	-----	-----	-----	(2)	-----	-----	-----	-----	-----	-----	-----	(2)	(2)
	1, 204	1, 165	1, 199	1, 171	1, 390	1, 411	1, 089	1, 382	1, 297	1, 539	1, 280	1, 717	15, 844	25, 945
By ports—														
Atlantic coast	-----	45	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	48	170
Gulf coast	107	70	83	30	214	48	131	98	169	313	131	133	1, 527	3, 019
Mexican border	3	2	1	2	2	1	3	2	1	3	3	79	102	138
Northern border	748	564	580	586	855	842	579	908	709	798	757	986	8, 912	16, 299
Pacific coast	346	484	532	553	319	520	376	374	418	425	389	519	5, 255	6, 319
	1, 204	1, 165	1, 199	1, 171	1, 390	1, 411	1, 089	1, 382	1, 297	1, 539	1, 280	1, 717	15, 844	25, 945
Excess of imports over exports	3, 389	3, 016	3, 383	2, 892	3, 167	2, 608	3, 734	4, 879	3, 825	3, 094	4, 059	4, 493	42, 539	52, 664

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[1] Includes imports recorded by Bureau of Foreign and Domestic Commerce as from Netherland West Indies.

[2] 241 barrels, valued at $333.

SHIPMENTS FROM CALIFORNIA THROUGH THE PANAMA CANAL

Shipments of California crude oil through the Panama Canal to eastern ports in the United States continued to decline in 1927, although at a reduced rate compared with the three previous years. In 1927 they totaled 10,692,000 barrels, as compared with 11,104,000 barrels in 1926. The overproduction of crude petroleum in the Mid-Continent field, combined with the increased receipts of oil from South America, checked shipments of California oil; it was perhaps surprising that the decrease in shipments was not more marked. Total shipments of refined products, particularly gasoline, were slightly higher than in 1926.

California oil shipped through the Panama Canal to Atlantic and Gulf ports in the United States, 1926–27, by months [1]

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year
1926													
Crude oil	1, 267	861	1, 285	1, 107	1, 565	962	1, 148	711	535	823	417	423	11, 104
Refined oils:													
Gasoline, naphtha, etc	852	447	603	680	771	464	892	862	481	765	646	990	8, 453
Tops	71	-----	-----	-----	-----	-----	-----	-----	153	-----	-----	-----	224
Gas oil and Diesel oil	312	363	479	494	586	366	553	622	558	375	626	466	5, 800
Fuel oil	680	652	696	471	426	430	530	1, 191	681	1, 045	598	715	8, 115
Lubricants	69	1	69	1	68	1	69	-----	140	70	-----	69	557
Asphalt	1	1	1	1	1	2	1	1	1	2	1	1	14
Total refined	1, 985	1, 464	1, 848	1, 647	1, 852	1, 263	2, 045	2, 676	2, 014	2, 257	1, 871	2, 241	23, 163
Total crude and refined	3, 252	2, 325	3, 133	2, 754	3, 417	2, 225	3, 193	3, 387	2, 549	3, 080	2, 288	2, 664	34, 267
1927													
Crude oil	390	831	572	462	1, 341	1, 247	1, 124	1, 313	818	844	864	886	10, 692
Refined oils:													
Gasoline, naphtha, etc	749	1, 101	606	872	999	1, 043	1, 133	1, 268	1, 047	984	939	934	11, 675
Kerosene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	74	74
Gas oil and Diesel oil	499	228	380	450	152	237	315	231	457	154	552	542	4, 197
Fuel oil	1, 072	1, 167	758	712	488	255	413	575	1, 060	363	75	72	7, 010
Lubricants	1	1	71	1	1	69	1	69	1	70	69	1	355
Asphalt	-----	1	1	1	1	1	2	1	4	2	2	1	17
Total refined	2, 321	2, 498	1, 816	2, 036	1, 641	1, 605	1, 864	2, 144	2, 569	1, 573	1, 637	1, 624	23, 328
Total crude and refined	2, 711	3, 329	2, 388	2, 498	2, 982	2, 852	2, 988	3, 457	3, 387	2, 417	2, 501	2, 510	34, 020

[1] Compiled by J. W. Mashaw and E. T. Knudsen of the San Francisco office of the Bureau of Mines.

STOCKS

In this report stocks of crude petroleum are classified as follows:

1. Refinery stocks, or stocks held at refineries. These are reported separately for east of California only. Data concerning stocks held by other consumers are not available.

2. Pipe-line and tank-farm stocks, or petroleum that has been transported from the producing properties but has not been delivered at refineries or other points of consumption. For the States east of California such stocks are reported monthly as gross stocks, which include the total contents of tanks and pipe lines, and as net stocks.

which are gross stocks minus sediment and water. The stocks reported for California were compiled by the San Francisco office of the Bureau of Mines and include all stocks of crude petroleum and fuel oil held on the Pacific coast, divided into two classes—light or refinable crude (20° A. P. I. and above) and heavy crude (under 20° A. P. I.) and fuel oil.

3. Producers' stocks, or petroleum held at the wells on the producing properties. Producers' stocks are reported annually and during the past several years have amounted to between 5,000,000 and 10,000,000 barrels annually.

4. Stocks of foreign crude petroleum held by importers elsewhere than at refineries.

The situation regarding stocks of crude petroleum east of California was completely changed in 1927 as compared with 1926. During 1926 stocks were materially reduced, but once the development at Seminole was well under way in the early part of 1927 stocks rapidly increased. The increase in total crude stocks east of California was slightly more than 75,000,000 barrels, the major part of which was tank-farm stocks in the Mid-Continent field. In California the situation as to stocks of light or refinable crude was one of the bright spots of the year. This class of stocks declined during the year from 30,861,000 to 20,086,000 barrels, or more than one-third. Stocks of heavy crude and fuel oil in California increased over 5,000,000 barrels, a figure that, though substantial, would have been considerably higher except for the cooperation shown by the operators in shutting-in some of their heavy-oil wells. Producers' stocks, or stocks at wells held east of California, amounted to 7,536,000 barrels on December 31, as compared with 5,904,000 barrels on hand at the beginning of the year. This increase, though material, was small in comparison with the increase in other classes of stocks and may be taken as an indication that producers have definitely abandoned the policy of storing large quantities of crude petroleum in open pits near the wells and of keeping their working tanks filled to capacity.

Stocks of crude petroleum in the United States on December 31, 1923–1927

[Thousands of barrels of 42 U. S. gallons]

Year	Refinery stocks of crude petroleum	Pipe-line and tank-farm stocks of domestic crude petroleum, by fields of origin								Producers' stocks[2]	Foreign petroleum held by importers	Total
		Appalachian	Lima-Indiana	Illinois-southwest Indiana	Mid-Continent	Gulf coast	Rocky Mountain	California[1]	Total			
1923	33,259	9,210	975	11,091	202,904	23,974	19,704	62,162	330,020	9,850	1,383	374,512
1924	40,995 [2] 31,184	9,286	1,221	10,870	210,558	20,200	28,672	68,867 [3] 96,505	349,674 [3] 377,312	8,389	734	399,792 [3] 417,619
1925	[2] 27,157 [4] 29,200	8,493	971	10,582	195,941	19,263	28,995	129,434 [5] 130,234	393,679 [5] 394,479	7,560	407	428,803 [4] [5] 431,646
1926	[2] 35,475	7,790	666	11,770	173,848	20,031	28,075	118,131 [6] 119,170	360,311 [6] 361,350	5,904	609	402,299 [6] 403,338
1927	[2] 39,317	7,334	1,134	12,170	246,839	17,922	27,238	113,805	426,442	7,536	84	473,379

[1] Includes producers' stocks.
[2] Exclusive of California.
[3] California stocks reported on new basis to include total stocks of crude petroleum and fuel oil.
[4] Includes 2,043,000 barrels in coastwise transit—for comparison with 1926 figures.
[5] Includes 800,000 barrels working stocks not previously recorded.
[6] Revised figures, for comparison with 1927.

Stocks of crude petroleum held in the United States at end of each month, 1926–27

[Thousands of barrels of 42 U. S. gallons]

		January	February	March	April	May	June	July	August	September	October	November	December
1926													
East of California:													
At refineries, by location of storage—													
East coast—													
Domestic		8,003	6,397	6,602	6,664	7,267	8,544	8,582	8,754	9,145	9,465	7,913	7,240
Foreign		2,754	2,473	3,113	3,242	2,919	2,681	3,092	3,078	2,648	2,220	2,354	2,186
Appalachian		1,546	1,579	1,616	1,624	1,653	1,688	1,722	1,659	1,688	1,675	1,664	1,673
Indiana, Illinois, etc		1,492	1,482	1,571	1,727	1,749	1,919	1,881	1,844	1,992	2,034	2,058	2,224
Oklahoma, Kansas, etc		3,594	3,607	3,558	4,072	3,825	3,713	3,081	2,889	2,312	2,287	2,548	2,926
Texas—													
Inland		1,155	1,114	740	1,025	1,227	1,147	1,133	1,010	942	863	952	952
Gulf coast—													
Domestic		5,533	6,176	5,975	6,642	6,501	6,736	6,627	7,029	7,571	7,536	7,903	8,194
Foreign		286	144	266	369	244	407	416	371	306	281	206	236
Arkansas and inland Louisiana		470	546	690	631	762	649	572	715	676	710	638	601
Louisiana, Gulf coast—													
Domestic		2,883	3,953	4,217	5,102	6,291	6,256	6,664	7,060	8,241	7,519	7,067	7,019
Foreign		1,556	1,531	1,871	1,732	1,807	1,464	1,089	1,111	909	766	761	802
Rocky Mountain		1,509	1,521	1,498	1,571	1,562	1,538	1,500	1,462	1,394	1,487	1,501	1,422
Total at refineries		30,781	30,523	31,717	34,401	35,807	36,742	36,359	36,982	37,824	36,843	35,565	35,475
Pipe-line and tank-farm stocks—													
Domestic petroleum, by fields of origin—													
Appalachian—													
New York, Pennsylvania, West Virginia, eastern and central Ohio	Gross	7,011	7,053	6,956	7,192	7,119	7,224	7,269	7,235	7,135	6,962	6,864	6,855
	Net	6,712	6,753	6,657	6,893	6,823	6,930	6,984	6,962	6,841	6,680	6,577	6,570
Kentucky	Gross	1,926	1,897	1,901	1,887	1,890	1,845	1,773	1,583	1,391	1,291	1,221	1,350
	Net	1,820	1,790	1,794	1,778	1,779	1,740	1,668	1,481	1,272	1,165	1,090	1,220
Lima-Indiana	Gross	1,139	1,107	1,084	1,091	1,053	998	973	931	945	913	900	877
	Net	937	905	882	889	851	796	771	731	733	702	689	666
Illinois-southwestern Indiana	Gross	11,083	11,480	11,947	12,250	12,518	12,334	12,212	11,930	11,934	12,068	12,216	12,255
	Net	10,606	11,001	11,468	11,771	12,039	11,854	11,731	11,451	11,448	11,631	11,731	11,770
Mid-Continent—													
Oklahoma, Kansas, north, central, western, and Panhandle Texas	Gross	161,406	159,480	157,381	154,077	150,557	148,103	148,116	147,414	148,513	149,451	153,475	154,558
	Net	149,258	147,175	144,932	141,381	137,932	135,279	135,445	135,089	136,197	137,350	140,925	142,208
North Louisiana and Arkansas	Gross	45,782	45,550	45,381	44,691	43,931	42,568	41,239	39,429	37,636	36,145	34,743	34,318
	Net	43,449	43,227	43,157	42,514	41,711	40,305	38,815	37,100	35,000	33,839	32,376	31,640
Gulf coast	Gross	18,805	17,905	17,635	16,600	16,710	17,968	16,395	17,688	18,664	19,806	19,339	20,430
	Net	18,441	17,506	17,261	16,259	16,333	16,568	16,003	17,300	18,255	19,418	18,965	20,031

Rocky Mountain — Gross	29, 200	29, 546	29, 954	30, 201	30, 589	30, 593	30, 577	30, 384	29, 933	29, 260	28, 620	28, 129
Net	29, 185	29, 505	29, 909	30, 156	30, 542	30, 548	30, 527	30, 335	29, 882	29, 211	28, 571	28, 075
Total pipe-line and tank-farm — Gross	276, 352	274, 018	272, 239	267, 989	264, 377	261, 633	258, 554	256, 594	256, 151	255, 896	257, 378	258, 772
Net	260, 408	257, 862	256, 060	251, 641	248, 010	244, 020	241, 944	240, 449	230 628	239, 996	240, 924	242, 180
Foreign crude petroleum held in United States by importers—												
At Atlantic coast stations	97	124	102	56	42	58	70	75	65	72	105	165
At Gulf coast stations	342	407	312	312	327	247	299	453	471	536	555	444
Total	439	531	414	368	369	305	369	528	536	608	660	609
Producers' stocks [1]	7, 419	7, 292	7, 151	7, 015	6, 874	6, 738	6, 597	6, 456	6, 320	6, 180	6, 044	5, 904
Total crude stocks east of California	299, 047	296, 208	295, 342	293, 425	291, 060	287, 805	285, 269	284, 415	284, 308	283, 627	283, 193	284, 168
California:												
Light	44, 197	44, 871	43, 973	[2] 38, 634	37, 192	35, 454	33, 548	32, 149	30, 494	30, 390	30, 051	30, 861
Heavy (including fuel oil)	86, 614	86, 744	88, 466	[2] 85, 656	88, 184	87, 364	88, 092	87, 772	87, 353	87, 529	87, 440	87, 270 [3] 88, 309
1927												
East of California:												
At refineries, by location of storage—												
East coast—												
Domestic	7, 426	7, 942	7, 230	8, 134	7, 754	8, 720	8, 999	9, 401	9, 062	8, 772	8, 045	8, 690
Foreign	2, 164	2, 604	2, 206	2, 782	3, 043	2, 909	2, 671	3, 029	2, 986	2, 675	2, 980	2, 768
Appalachian	1, 597	1, 606	1, 627	1, 648	1, 662	1, 668	1, 785	1, 783	1, 768	1, 740	1, 822	1, 871
Indiana, Illinois, etc	2, 284	2, 491	2, 561	2, 545	2, 465	2, 507	2, 561	2, 746	2, 727	2, 737	2, 692	2, 777
Oklahoma, Kansas, etc	3, 135	3, 551	3, 841	3, 922	4, 301	4, 413	4, 428	4, 400	4, 536	4, 850	4, 924	4, 871
Texas—												
Inland	1, 094	1, 120	1, 197	1, 173	1, 196	1, 304	1, 450	1, 463	1, 621	1, 677	1, 656	1, 432
Gulf coast—												
Domestic	8, 133	8, 305	8, 481	8, 220	8, 307	6, 961	6, 657	6, 758	7, 295	7, 473	7, 653	7, 686
Foreign	152	237	257	323	304	242	226	203	204	174	204	219
Arkansas and inland Louisiana	553	560	441	408	420	431	454	448	355	402	457	408
Louisiana, Gulf coast—												
Domestic	6, 787	7, 179	7, 317	6, 788	4, 793	4, 037	4, 559	5, 126	5, 130	5, 643	6, 104	6, 149
Foreign	722	967	889	832	1, 072	1, 282	1, 373	1, 288	1, 083	1, 043	1, 150	1, 046
Rocky Mountain	1, 608	1, 504	1, 385	1, 380	1, 181	1, 293	1, 382	1, 385	1, 446	1, 368	1, 394	1, 400
Total at refineries	35, 655	38, 066	37, 432	38, 155	36, 498	35, 767	36, 545	38, 030	38, 213	38, 554	39, 081	39, 317

[1] Figures for December based on reports from companies; other months prorated.

[2] Loss by fire, 4,600,000 barrels light crude and 3,204,000 barrels heavy crude, total, 7,804,000 barrels.

[3] Revised figures, for comparison with 1927.

Stocks of crude petroleum held in the United States at end of each month, 1926–27—Continued

[Thousands of barrels of 42 U. S. gallons]

		January	February	March	April	May	June	July	August	September	October	November	December
1927—Continued													
East of California—Continued.													
Pipe-line and tank-farm stocks—													
Domestic petroleum, by fields of origin—													
Appalachian—													
New York, Pennsylvania, West Virginia, eastern and central Ohio	Gross	6,607	6,676	6,724	6,879	6,976	7,046	7,156	7,216	7,051	6,859	6,795	6,621
	Net	6,321	6,392	6,441	6,597	6,693	6,772	6,883	6,946	6,726	6,541	6,499	6,294
Kentucky	Gross	1,243	1,244	1,276	1,338	1,413	1,404	1,324	1,302	1,269	1,207	1,216	1,168
	Net	1,118	1,119	1,151	1,212	1,288	1,279	1,199	1,176	1,139	1,080	1,090	1,040
Lima-Indiana	Gross	879	877	907	942	983	1,019	1,098	1,106	1,159	1,230	1,263	1,287
	Net	667	666	695	731	771	820	899	946	1,006	1,077	1,109	1,134
Illinois-southwestern Indiana	Gross	12,372	12,293	12,295	12,247	12,214	12,198	12,669	12,676	12,639	12,626	12,708	12,664
	Net	11,887	11,808	11,810	11,762	11,729	11,712	12,184	12,184	12,113	12,100	12,189	12,170
Mid-Continent—													
Oklahoma, Kansas, north, central, western, and Panhandle Texas	Gross	159,699	165,789	171,372	179,064	188,505	196,728	205,042	213,200	219,649	226,639	230,466	234,420
	Net	147,146	153,462	159,666	167,024	176,398	184,865	193,217	201,313	207,592	214,803	219,130	221,466
North Louisiana and Arkansas	Gross	32,825	31,572	31,347	31,098	30,460	30,906	31,357	29,929	29,393	28,107	28,021	28,174
	Net	30,182	29,074	28,473	27,603	27,793	28,193	27,791	27,199	26,641	25,546	25,594	25,373
Gulf coast	Gross	18,608	18,186	18,511	18,653	18,774	18,937	18,395	18,424	18,661	18,662	18,653	18,365
	Net	18,283	17,832	18,159	18,285	18,397	18,558	17,985	17,945	18,223	18,244	18,265	17,922
Rocky Mountain	Gross	27,584	27,387	26,956	27,056	27,165	27,257	27,434	27,478	27,647	27,716	27,298	27,281
	Net	27,532	27,289	26,904	27,002	27,114	27,203	27,377	27,415	27,599	27,670	27,256	27,238
Total pipe-line and tank-farm	Gross	259,817	264,024	269,388	277,277	286,490	295,495	304,475	311,331	317,468	323,046	326,420	329,980
	Net	243,136	247,642	253,299	260,216	270,183	279,402	287,535	295,124	301,039	307,061	311,132	312,637
Foreign crude petroleum held in United States by importers—													
At Atlantic coast stations		84	108	70	109	80	58	42	39	37	51	41	46
At Gulf coast stations		427	450	341	339	206	237	256	220	183	198	233	38
Total		511	558	411	448	286	295	298	259	220	249	274	84
Producers' stocks[1]		5,934	5,967	6,001	6,040	6,073	6,112	6,229	6,473	6,813	7,066	7,256	7,536
Total crude stocks east of California		285,236	292,233	297,143	304,859	313,040	321,576	330,607	339,886	346,285	352,930	357,743	359,574
California:													
Light		31,017	29,770	29,568	29,460	27,143	26,898	25,301	23,262	22,826	21,676	21,273	20,086
Heavy (including fuel oil)		89,043	88,834	89,103	89,537	91,407	91,964	93,011	93,353	93,820	92,233	93,880	93,719

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[1] Figures for December based on reports from companies; other months prorated.

CONSUMPTION

The consumption of crude petroleum in the United States in 1927, measured by refinery runs to stills, established a new high figure of 828,835,000 barrels, an increase of 49,571,000 barrels, or 6 per cent, over 1926. Of the total, 778,729,000, or 94 per cent, was domestic crude petroleum and 50,106,000 barrels, or 6 per cent, was foreign crude petroleum. The increase in runs of domestic crude petroleum over 1926 was 6 per cent, while that of foreign crude petroleum was 11 per cent. Runs to stills showed a comparatively steady increase throughout the year, regardless of season; the daily average was highest in November, when the throughput of domestic and foreign crude petroleum was 2,333,000 barrels per day. Of the major refining districts of the country only two—Louisiana Gulf coast and Rocky Mountain—showed decreased runs to stills in 1927 as compared with 1926. As has been the case for several years, the percentage increase in runs to stills in 1927 was considerably less than the increase in gasoline consumption. That there was not an acute shortage of gasoline was due partly to the fact that stocks were drawn on extensively but mainly to the fact that gasoline recovery again increased.

The domestic consumption of all oils, obtained by a calculation which gives a figure for the combined consumption of crude petroleum and the various refined products, amounted to 805,578,000 barrels, a gain of only 3 per cent over 1926. This small gain in the face of a 13 per cent gain in indicated domestic demand for gasoline may be explained mainly by the fact that the indicated domestic demand for the other refined products decreased. In addition to the consumption of all oils in this country, 141,035,000 barrels of crude petroleum and refined products was exported or shipped to noncontiguous Territories; this amount added to the indicated domestic demand gives a total demand of 945,613,000 barrels, a gain of 4 per cent over 1926.

Crude petroleum run to stills at refineries in the United States, 1926–27, by districts and months

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year
1926													
East coast:													
Domestic	7, 361	6, 963	7, 830	7, 666	8, 081	8, 302	9, 332	8, 505	8, 035	9, 437	10, 300	9, 535	101, 347
Foreign	1, 948	1, 860	2, 664	2, 287	2, 386	2, 113	2, 249	2, 663	2, 896	2, 656	2, 572	3, 002	29, 296
Appalachian	2, 135	2, 146	2, 300	2, 263	2, 383	2, 391	2, 470	2, 554	2, 457	2, 550	2, 432	2, 421	28, 502
Indiana, Illinois, etc	5, 518	5, 183	5, 556	5, 613	6, 194	5, 956	6, 032	6, 016	5, 861	5, 957	5, 911	5, 910	69, 707
Oklahoma, Kansas, etc	7, 741	6, 924	7, 310	7, 536	8, 692	8, 333	8, 505	8, 621	8, 530	8, 123	8, 034	8, 157	96, 506
Texas:													
Inland	2, 752	2, 609	2, 890	2, 884	3, 026	3, 041	3, 153	3, 191	3, 082	3, 257	3, 040	3, 258	36, 183
Gulf coast—													
Domestic	9, 030	8, 133	9, 030	9, 212	9, 158	9, 709	9, 851	9, 947	9, 673	10, 942	10, 235	11, 323	116, 243
Foreign	441	459	513	460	219	266	305	248	217	171	238	147	3, 684
Arkansas and inland Louisiana	1, 434	1, 413	1, 542	1, 626	1, 610	1, 426	1, 626	1, 689	1, 756	1, 742	1, 829	1, 814	19, 507
Louisiana, Gulf coast:													
Domestic	4, 066	3, 047	3, 574	3, 244	3, 078	3, 292	3, 119	2, 989	2, 974	3, 501	3, 139	3, 499	39, 522
Foreign	311	904	933	1, 041	1, 159	1, 235	1, 216	1, 247	1, 123	859	967	988	11, 983
Rocky Mountain	2, 170	2, 123	2, 341	2, 304	2, 434	2, 490	2, 542	2, 532	2, 506	2, 654	2, 546	2, 563	29, 205
California	16, 196	14, 583	16, 260	15, 395	16, 934	16, 256	16, 935	17, 387	17, 310	17, 058	16, 398	16, 867	197, 579
	61, 103	56, 347	62, 743	61, 531	65, 354	64, 810	67, 335	67, 589	66, 420	68, 907	67, 641	69, 484	779, 264
1927													
East coast:													
Domestic	9, 049	7, 877	9, 223	8, 625	9, 295	9, 095	9, 296	9, 494	9, 032	9, 235	9, 127	9, 164	108, 512
Foreign	2, 499	2, 326	2, 968	2, 823	2, 776	3, 020	3, 222	3, 888	3, 817	4, 670	4, 756	5, 282	42, 047
Appalachian	2, 367	2, 278	2, 406	2, 358	2, 401	2, 407	2, 384	2, 477	2, 449	2, 650	2, 365	2, 399	28, 941
Indiana, Illinois, etc	5, 931	5, 096	5, 905	5, 571	6, 521	6, 629	7, 068	6, 656	6, 133	6, 504	6, 716	7, 077	75, 807
Oklahoma, Kansas, etc	7, 973	7, 655	8, 062	8, 033	8, 398	8, 457	9, 227	9, 251	9, 133	8, 856	8, 342	8, 484	101, 871
Texas:													
Inland	3, 052	2, 874	3, 080	2, 943	3, 026	3, 183	3, 271	3, 070	2, 962	3, 145	3, 298	3, 188	37, 092
Gulf coast—													
Domestic	11, 460	10, 001	10, 825	10, 339	11, 152	10, 343	10, 859	10, 514	10, 047	11, 498	11, 027	11, 124	129, 189
Foreign	120	58	85	100	109	96	51	24	23	43	21	84	814
Arkansas and inland Louisiana	1, 799	1, 718	1, 768	1, 699	1, 779	1, 710	1, 653	1, 704	1, 630	1, 517	1, 473	1, 581	20, 031
Louisiana, Gulf coast:													
Domestic	3, 846	3, 458	4, 014	4, 021	3, 627	3, 259	3, 391	3, 380	3, 559	3, 720	3, 384	3, 509	43, 168
Foreign	1, 032	765	734	466	549	522	562	591	549	525	456	494	7, 245
Rocky Mountain	2, 469	2, 278	2, 441	2, 336	1, 903	1, 998	2, 139	1, 907	1, 638	1, 866	2, 030	2, 021	25, 026
California	17, 931	16, 577	17, 161	17, 179	18, 164	16, 848	18, 282	18, 001	17, 560	17, 532	16, 993	16, 864	209, 092
	69, 528	62, 961	68, 672	66, 493	69, 700	67, 567	71, 405	70, 957	68, 532	71, 761	69, 988	71, 271	828, 835

Indicated deliveries of crude petroleum (exclusive of California grades) to domestic consumers, 1926–27, by months [1]

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year
1926													
Domestic petroleum, by fields of origin:													
Appalachian	2, 129	2, 121	2, 484	2, 160	2, 433	2, 388	2, 515	2, 675	2, 785	2, 759	2, 564	2, 330	29, 343
Lima-Indiana	192	191	203	164	214	250	208	214	167	197	159	179	2, 338
Michigan	2	1	2	3	3	3	4	7	8	15	20	26	94
Illinois and southwestern Indiana	666	261	313	331	440	904	859	1, 005	715	522	573	652	7, 241
Mid-Continent	35, 293	31, 487	34, 914	37, 429	39, 044	38, 448	37, 318	38, 824	37, 344	39, 507	37, 569	40, 536	447, 713
Gulf coast	3, 652	3, 627	3, 001	3, 757	2, 740	2, 395	4, 208	3, 574	3, 954	3, 731	5, 539	4, 306	44, 484
Rocky Mountain [2]	2, 978	2, 702	3, 080	3, 026	3, 004	3, 251	3, 483	3, 441	3, 548	3, 685	3, 426	3, 085	38, 709
Deliveries and exports	44, 912	40, 390	43, 997	46, 870	47, 878	47, 639	48, 595	49, 740	48, 521	50, 416	49, 850	51, 114	569, 922
Exports	957	780	664	730	1, 037	811	965	789	718	851	909	811	10, 022
Deliveries	43, 955	39, 610	43, 333	46, 140	46, 841	46, 828	47, 630	48, 951	47, 803	49, 565	48, 941	50. 303	559, 900
Foreign petroleum	4, 656	3, 651	7, 332	5, 952	4, 500	5, 635	5, 121	5, 173	4, 342	3, 788	4, 991	5, 038	60, 179
	48, 611	43, 261	50, 665	52, 092	51, 341	52, 463	52, 751	54, 124	52, 145	53, 353	53, 932	55, 341	620, 079
1927													
Domestic petroleum, by fields of origin:													
Appalachian	2, 681	2, 246	2, 595	2, 322	2, 441	2, 534	2, 517	2, 653	2, 843	2, 837	2, 561	2, 685	30, 915
Lima-Indiana	139	157	141	120	121	122	77	111	93	82	99	104	1, 366
Michigan	29	29	38	40	39	41	37	40	38	38	33	33	435
Illinois and southwestern Indiana	527	696	751	637	693	679	164	672	711	635	537	615	7, 317
Mid-Continent	37, 396	35, 089	39, 073	36, 654	36, 976	36, 707	40, 846	41, 359	40, 812	41, 645	41, 696	43, 688	471, 941
Gulf coast	6, 605	4, 674	4, 279	4, 265	4, 438	4, 290	4, 900	4, 296	3, 901	4, 262	4, 016	4, 553	54, 479
Rocky Mountain [2]	3, 203	2, 702	3, 102	2, 637	2, 623	2, 484	2, 603	2, 477	2, 125	2, 243	2, 709	2, 483	31, 391
Deliveries and exports	50, 580	45, 593	49, 979	46, 675	47, 331	46, 857	51, 144	51, 608	50, 523	51, 742	51, 651	54, 161	597, 844
Exports	858	681	667	618	1, 071	890	713	1, 008	879	1, 114	890	1, 198	10, 587
Deliveries	49, 722	44, 912	49, 312	46, 057	46, 260	45, 967	50, 431	50, 600	49, 644	50, 628	50, 761	52, 963	587, 257
Foreign petroleum	4, 691	4, 134	4, 729	4, 026	4, 719	4, 010	4, 820	6, 300	5, 161	4, 604	5, 314	6, 400	58, 908
	54, 413	49, 046	54, 041	50, 083	50, 979	49, 977	55, 251	56, 900	54, 805	55, 232	56, 075	59, 363	646, 165

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[1] Indicated deliveries equal production plus imports plus stocks, exclusive of refinery stocks, at beginning of period minus exports and stocks at end of period.

[2] Includes Alaska.

Crude petroleum and fuel oil consumed for fuel, 1923–1927

[Thousands of barrels of 42 U. S. gallons]

	1923	1924	1925	1926	1927
Crude oil:					
On producing oil properties	4, 316	4, 284	4, 286	3, 079	2, 824
In operation of pipe lines east of California	1, 715	1, 852	1, 825	1, 993	2, 097
Fuel oil (including some crude and gas oil):					
By refineries	(1)	(1)	50, 455	46, 416	41, 462
By locomotives (all services, class 1 carriers) [2]	55, 580	58, 950	58, 520	58, 564	57, 781
By vessels cleared for foreign countries (bunker oil) [3]	37, 582	43, 328	42, 827	46, 662	50, 051
By U. S. Navy (fiscal year) [4]	5, 837	7, 044	7, 100	7, 404	7, 169
By U. S. Shipping Board—					
Domestic oil Mexican oil Open-market purchase	19, 049	18, 579	12, 570	12, 983	13, 074
By gas manufacturers	[5] 22, 156	[6] 23, 498	[6] 22, 556	[6] 23, 719	[6] 23, 041
By electric public-utility power plants [7]	14, 679	16, 630	10, 246	9, 399	6, 782

[1] Data not available.
[2] Interstate Commerce Commission.
[3] Bureau of Foreign and Domestic Commerce.
[4] Navy Department.
[5] Bureau of the Census.
[6] American Gas Association.
[7] U. S. Geological Survey.

PRICES AND VALUES

The overproduction of crude petroleum in the latter part of 1926 and during 1927 resulted, as would be expected, in general reduction in posted prices. This decline, which often cut prices nearly in half in less than a year, had a material effect on value at wells. Although the total quantity produced in 1927 was 17 per cent higher than in 1926, the total value at the wells was 19 per cent lower. The total value in 1927 was $1,172,830,000, an average of $1.30 per barrel, or a decline of $0.58, or 31 per cent, from 1926. The only State to show an increase in the average value per barrel in 1927 was Montana, where the average rose from $1.32 in 1926 to $1.40 in 1927. Singularly enough, Montana was the only State in 1926 that showed a material decrease in average value from 1925; the decrease was due to the abrupt production decline at Kevin-Sunburst, the principal oil field of the State.

In 1927 price movements were similar for nearly all grades of crude petroleum east of California, the highest price being recorded at the beginning of the year, followed by several reductions in the period February to April, with no change thereafter. There were several exceptions to this general tendency, however, particularly the crudes of the Appalachian, Arkansas, west Texas, and California fields. In the Appalachian area prices were weak until fall, when a brisk demand for this type of crude in the manufacture of lubricants resulted in two small price increases. In the Smackover field prices were comparatively firm in the spring and did not weaken generally until late in the year. Prices of west Texas crudes, which at the beginning of the year were on the gravity basis, were steady until the adverse effects of surplus production in the late summer were felt; they were then reduced to the low figure of $0.60 for all grades. Only one price change, affecting all crudes except those below 15° A. P. I. gravity, was recorded in California during the year. This occurred on April 1 and for some of the grades averaged about 50 per cent of the price on January 1.

Average price per barrel paid for crude petroleum at the wells, 1923–1927, by States

[Based on actual purchases, including premiums]

State	1923	1924	1925	1926	1927	State	1923	1924	1925	1926	1927
Alaska	(1)	(1)	$4.25	(1)	(1)	Ohio:					
Arkansas	$0.69	$0.94	.89	$1.11	$1.06						
California [2]	.92	1.20	1.42	1.54	1.13	Central and eastern	$2.57	$2.74	$2.67	$2.74	$2.02
Colorado	1.19	1.10	1.48	1.84	1.20	Northwestern	2.02	2.00	2.17	2.34	1.80
Illinois	1.87	1.76	1.94	2.22	1.67	Total Ohio	2.41	2.52	2.53	2.64	1.97
Indiana:						Oklahoma	1.74	1.57	1.97	2.31	1.43
Southwestern	1.82	1.80	1.92	2.22	1.65	Pennsylvania	3.33	3.61	3.62	3.56	3.06
Northeastern	1.84	1.93	2.06	2.07	1.51	Tennessee	1.75	1.80	2.21	2.33	1.50
Total Indiana	1.82	1.84	1.95	2.19	1.63	Texas:					
Kansas	1.63	1.54	1.94	2.26	1.42	Gulf coast	1.39	1.56	1.62	1.50	1.30
Kentucky	1.97	1.97	2.32	2.43	1.67	Rest of State	1.50	1.51	1.86	1.96	1.10
Louisiana:						Total Texas	1.48	1.52	1.81	1.85	1.14
Gulf coast	1.36	1.63	1.57	1.39	1.21	Utah	------	(1)	1.00	(1)	(1)
Northern	1.48	1.41	1.61	1.70	1.33	West Virginia	3.27	3.52	3.48	3.46	2.89
Total Louisiana	1.47	1.44	1.60	1.65	1.30	Wyoming	1.09	1.23	1.76	1.98	1.40
Michigan	------	------	2.50	2.69	1.90	Other	[3] 2.28	[4] 3.38	------	[4] 1.25	[4] 4.71
Montana	1.47	1.33	1.57	1.32	1.40						
New Mexico	(1)	1.30	1.71	1.96	1.37	United States	1.34	1.43	1.68	1.88	1.30
New York	3.31	3.64	3.70	3.68	3.17						

[1] Included under "Other."
[2] Division of Mines and Mining, Department of Natural Resources, California.
[3] Alaska, Missouri, and New Mexico.
[4] Alaska and Utah.

Average monthly prices per barrel for selected grades of crude petroleum at wells, 1926–27

	Pennsylvania	Oklahoma-Kansas (34–34.9°)	Gulf Coast Grade A	Illinois	Lima, Ohio	Panhandle (Carson and Hutchinson Counties)	California (Long Beach 30–30.9°)
1926							
January	$3.55	$1.63	$1.50	$1.87	$1.98	$1.35	$1.46
February	3.69	1.88	1.50	2.11	2.22	1.50	1.46
March	3.61	1.88	1.50	2.12	2.23	1.50	1.62
April	3.55	1.88	1.50	2.12	2.23	1.54	1.70
May	3.55	2.02	1.55	2.24	2.35	1.60	1.70
June	3.55	2.13	1.60	2.37	2.48	1.65	1.70
July	3.36	2.13	1.60	2.37	2.48	1.65	1.70
August	3.30	2.13	1.59	2.37	2.48	1.65	1.70
September	3.30	2.13	1.40	2.37	2.48	1.65	1.70
October	3.30	2.13	1.40	2.37	2.48	1.29	1.70
November	3.19	1.98	1.40	2.24	2.35	1.25	1.70
December	3.05	1.80	1.40	2.10	2.21	1.25	1.70
	3.41	1.98	1.50	2.22	2.33	1.49	1.65
1927							
January	3.20	1.80	1.40	2.10	2.21	1.25	1.70
February	3.27	1.75	1.40	2.06	2.17	1.25	1.70
March	3.07	1.32	1.26	1.69	1.80	1.03	1.70
April	2.90	1.24	1.20	1.60	1.71	.95	1.00
May	2.80	1.24	1.20	1.60	1.71	.95	1.00
June	2.80	1.24	1.20	1.60	1.71	.95	1.00
July	2.80	1.24	1.20	1.60	1.71	.95	1.00
August	2.55	1.24	1.20	1.60	1.71	.89	1.00
September	2.55	1.24	1.20	1.60	1.71	.75	1.00
October	2.55	1.24	1.20	1.60	1.71	.75	1.00
November	2.55	1.24	1.20	1.60	1.71	.75	1.00
December	2.62	1.24	1.20	1.60	1.71	.75	1.00
	2.80	1.33	1.24	1.68	1.79	.93	1.17

Posted price per barrel of petroleum at wells in 1927, by grades, with dates of change

Date	Appalachian field [1]													Lima-Indiana field [2]		Illinois and southwestern Indiana field [2]			Michigan [3]	
		Pennsylvania grade								Somerset oil in lines of Cumberland Pipe Line Co.										
	Pennsylvania grade in lines of New York Transit Co. and Bradford grade in lines of National Transit Co.	In lines of Southwest Pennsylvania Pipe Line Co. and National Transit Co.	In lines of Eureka Pipe Line Co.	In lines of Buckeye Pipe Line Co.	Keister grade in lines of National Transit Co.	Cabell grade in lines of Eureka Pipe Line Co.	Corning grade in lines of Buckeye Pipe Line Co.[4]	Wooster [2]	Ragland	Medium	Light	Western Kentucky [2]	Tennessee [5]	Lima, Ohio	Indiana	Illinois and Princeton, Ind.	Plymouth	Waterloo	Saginaw sand	Berea sand
Jan. 1	$3.15	$3.05	$3.00	$2.80	$1.80	$2.10	$2.25	$2.25	$0.95	$2.20	$2.35	$1.83	$2.35	$2.21	$1.98	$2.10	$1.63	$1.35	$2.95	
Jan. 14	3.40	3.30	3.25	3.10																
										Somerset oil in lines of Cumberland Pipe Line Co.										
Jan. 31										$2.20										
Feb. 1													2.20							
Feb. 19					1.60	1.90				2.00										
Feb. 21													2.00							
Feb. 23	3.25	3.15	3.10	2.95				2.05				1.63		2.01	1.78	1.90	1.43			$2.03
Feb. 24							2.05													
Mar. 2					1.40	1.70	1.85			1.80			1.80							
Mar. 7	3.15	3.05	3.00	2.85	1.25	1.55		1.90		1.65		1.46	1.65	1.84	1.61	1.73				1.74
Mar. 8							1.65													
Mar. 14								1.77				1.33		1.71	1.48	1.60	1.33			1.46
Mar. 16						1.40				1.50			1.50							
Mar. 17							1.55													
Mar. 26																				1.71
Apr. 13	2.90	2.80	2.75	2.60	1.10															

Apr. 18	--------	--------	--------	--------	--------	--------	1.45	--------	------	--------	------	------	------	------	------	------	------	2.05	1.95
May 27	--------	--------	--------	--------	--------	--------	--------	--------	------	--------	------	------	------	------	------	------	------	------	------
Aug. 1	2.65	2.55	2.50	2.35	--------	--------	--------	--------	------	--------	------	------	------	------	------	------	------	------	------
Aug. 2	--------	--------	--------	--------	--------	--------	--------	1.57	------	--------	------	------	------	------	------	------	------	------	------
Aug. 23	--------	--------	--------	2.25	--------	--------	--------	--------	------	--------	------	------	------	------	------	------	------	------	------
Dec. 3	2.75	2.60	2.55	--------	--------	1.50	--------	--------	------	1.60	------	------	------	------	------	------	------	------	------
Dec. 17	2.80	2.65	2.60	2.35	--------	--------	--------	--------	------	--------	------	------	------	------	------	------	------	------	------
Average for year	2.91	2.80	2.75	2.56	1.23[4]	1.52	1.60	1.77	.95	[6] 1.62	1.41	1.63	1.79	1.56	1.68	1.38	1.35	2.41	1.88

[1] The Joseph Seep Purchasing Agency.
[2] The Ohio Oil Co.
[3] The Sun Oil Co.
[4] Corning crude run prior to Sept. 15, 1926, posted at 10 cents less.
[5] Paragon Development Co.
[6] Somerset medium.

Date	Mid-Continent field																										
	Kansas-Oklahoma; north and central Texas[1]																										Corsicana[2]
	Below 28°[3]	28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°	37–37.9°	38–38.9°	39–39.9°	40–40.9°	41–41.9°	42–42.9°	43–43.9°	44–44.9°	45–45.9°	46–46.9°	47–47.9°	48–48.9°	49–49.9°	50–50.9°	51–51.9°	52° and above	Heavy
Jan. 1	$1.30	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85	$1.90	$1.95	$2.00	$2.05	$2.10	$2.15	$2.20	$2.25	$2.30	$2.35	$2.40	$2.45	$2.50	$2.55	$2.60	$2.65	$2.70	$1.25
Feb. 22	-----	1.35	1.39	1.43	1.47	1.51	1.55	1.59	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	2.03	2.07	2.11	2.15	2.19	2.23	2.27	2.31	--------
Mar. 5[4]	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.65	1.68	1.71	1.74	1.77	1.80	1.83	1.86	1.89	1.92	1.95	1.10
Mar. 12[5]	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.32	1.34	1.36	1.38	1.40	1.42	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60	--------
Apr. 7[6]	1.05	1.05	1.05	1.05	1.05	1.05	1.07	1.09	1.11	1.13	1.15	1.17	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.39	1.41	1.43	1.45	--------
Apr. 20[6]	.95	.95	.95	.95	.95	.95	.97	.99	1.01	1.03	1.05	1.07	1.09	1.11	1.13	1.15	1.17	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.35	--------
May 5[6]	1.05	1.05	1.05	1.05	1.05	1.05	1.07	1.09	1.11	1.13	1.15	1.17	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.39	1.41	1.43	1.45	--------
Sept. 14[6]	1.05	1.05	1.05	1.16	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.32	1.34	1.36	1.38	1.40	1.42	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60	--------
Average for year[7]	-----	1.18	1.21	1.23	1.26	1.28	1.31	1.33	1.36	1.38	1.41	1.43	1.46	1.48	1.51	1.53	1.56	1.58	1.61	1.63	1.66	1.68	1.71	1.73	1.76	1.78	1.13
Average for year[6]	1.10	1.13	1.14	1.18	1.20	1.21	1.24	1.26	1.29	1.31	1.34	1.36	1.39	1.41	1.44	1.46	1.49	1.51	1.54	1.56	1.59	1.61	1.64	1.66	1.69	1.71	--------

[1] Prairie Oil & Gas Co., and other major purchasing companies.

[2] Magnolia Petroleum Co.

[3] Magnolia Petroleum Co. For gravities lower than 28° Humble Oil & Refining Co. began the year with a posted scale of 5 cents per barrel decrease for each lower degree of gravity; Feb. 22, the differential was changed to 4 cents per barrel; Mar. 7, grades below 28° were posted at the same price as 28°; and Nov. 16, the following prices for grades below 28° were posted: Below 25°, $0.90; 25–25.9°, $1.06; 26–26.9°, $1.08; 27–27.9°, $1.10.

[4] Met by Humble Oil & Refining Co. Mar. 7.

[5] Prairie Oil & Gas Co., Gulf Pipe Line Co., and Magnolia Petroleum Co. Met by the Carter Oil Co., Humble Oil & Refining Co., Kay County Gas Co., and the Texas Co. on Mar. 14.

[6] Magnolia Petroleum Co. only.

[7] Prairie Oil & Gas Co.

Posted price per barrel of petroleum at wells in 1927, by grades, with dates of change—Continued

Date	Mid-Continent field—Continued																											
	South central and eastern Texas												Southwest Texas, Mirando[3]	West Texas														
	Panola County[1]	Somerset[2]												Crane,[4] Upton, Crockett, and Pecos[5]													Howard[6]	Iatan[7]
	32–32.9°	28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°	37–37.9°	38° and above		Below 26°	26–26.9°	27–27.9°	28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36° and above			
Jan. 1	[8] $1.70	$1.35	$1.45	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85	$1.90	$1.95	$2.00	$1.25	$0.80	$0.85	$0.90	$0.95	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.65	$1.50
Feb. 22	------	------	------	------	------	------	------	------	------	------	------	------	------	------	.84	.88	.92	.96	1.00	1.04	1.08	1.12	1.16	1.20	1.24	1.43	------
Feb. 23	------	------	1.39	1.43	1.47	1.51	1.55	1.59	1.63	1.67	1.71	1.75	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Mar. 5		------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1.29	
Mar. 7		1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.53	1.10	------	.83	.86	.89	.92	.95	.98	1.01	1.04	1.07	1.10	1.13	------	
Mar. 12		1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.32	------	------	------	------	------	------	------	------	------	------	------	------	------	1.16	
Mar. 14		------	------	------	------	------	------	------	------	------	------	------	1.00	.70	.72	.74	.76	.78	.80	.82	.84	.86	.88	.90	.92	------	
Apr. 7		1.05	1.05	1.05	1.05	1.05	1.07	1.09	1.11	1.13	1.15	1.17	------	------	------	------	------	------	------	------	------	------	------	------	------	------	
May 21	(9)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1.05	(9)
														All grades														
Aug. 23		------	------	------	------	------	------	------	------	------	------	------	------	$0.60												------	
Average for year	------	1.11	1.13	1.15	1.16	1.17	1.20	1.22	1.25	1.27	1.30	1.33	1.05	[10].76												1.17	------

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[1] Magnolia Petroleum Co.
[2] Grayburg Pipe Line Co.
[3] Humble Oil & Refining Co.
[4] Gulf Pipe Line (first posting Mar. 7), Humble Oil & Rfg. Co., Kay County Gas Co.
[5] First posting of Pecos included by Humble Oil & Refining Co., Aug. 24.
[6] Kay County Gas Co.
[7] Magnolia Petroleum Co. Includes Howard and Westbrook.
[8] Five cents per barrel increase for each higher degree of gravity to 38°.
[9] Posted on gravity basis with North Texas oils after Mar. 5.
[10] 29–29.9° gravity.

Date	Mid-Continent field—Continued																	
	Panhandle[1]																	
	Carson and Hutchinson Counties	Gray and Wheeler[2] Counties[3]																
		28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°	37–37.9°	38–38.9°	39–39.9°	40–40.9°	41–41.9°	42–42.9°	43–43.9°	44° and above
Jan. 1	$1.25	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80
Feb. 22			1.04	1.08	1.12	1.16	1.20	1.24	1.28	1.32	1.36	1.40	1.44	1.48	1.52	1.56	1.60	1.64
Mar. 7	1.05	.90	.93	.96	.99	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.32	1.35	1.38
Mar. 14	.95	.80	.82	.84	.86	.88	.90	.92	.94	.96	.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12
Aug. 23[2]	.75																	
Average for year	.93	.84	.86	.89	.91	.94	.96	.99	1.01	1.04	1.06	1.09	1.11	1.14	1.16	1.19	1.22	1.24

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[1] Kay County Gas Co., Gulf Pipe Line Co., Humble Oil & Rfg. Co.

[2] Wheeler crude at beginning of year was 10 cents lower for each degree of gravity than Gray crude of same gravity. Quotations made same as for Gray County on Feb. 22. Aug. 23 all Wheeler grades were posted with Carson and Hutchinson Counties at 75 cents.

[3] Humble Oil & Rfg. Co.

Date	Mid-Continent field—Continued																									
	North Louisiana and Arkansas																									
	Bull Bayou, Caddo, Crichton, De Soto, Haynesville, Homer, El Dorado[1]																									
	Below 28°	28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°	37–37.9°	38–38.9°	39–39.9°	40–40.9°	41–41.9°	42–42.9°	43–43.9°	44–44.9°	45–45.9°	46–46.9°	47–47.9°	48–48.9°	49–49.9°	50–50.9°	51–51.9°	52° and above
Jan. 1	$1.40	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85	$1.90	$1.95	$2.00	$2.05	$2.10	$2.15	$2.20	$2.25	$2.30	$2.35	$2.40	$2.45	$2.50	$2.55	$2.60	$2.65	$2.70
Feb. 24	1.25	1.35	1.39	1.43	1.47	1.51	1.55	1.59	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	2.03	2.07	2.11	2.15	2.19	2.23	2.27	2.31
Mar. 8	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.65	1.68	1.71	1.74	1.77	1.80	1.83	1.86	1.89	1.92	1.95
Mar. 14	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.32	1.34	1.36	1.38	1.40	1.42	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60
Average for year	1.15	1.19	1.21	1.24	1.26	1.29	1.31	1.34	1.36	1.39	1.41	1.44	1.46	1.49	1.51	1.54	1.56	1.59	1.62	1.64	1.67	1.69	1.72	1.74	1.77	1.79

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[1] Standard Oil Co. of Louisiana.

Posted price per barrel of petroleum at wells in 1927, by grades, with dates of change—Continued

<table>
<tr><th rowspan="4">Date</th><th colspan="15">Mid-Continent field—Continued</th></tr>
<tr><th colspan="15">North Louisiana and Arkansas—Continued</th></tr>
<tr><th rowspan="2">Bellevue[1] extra heavy below 32°</th><th rowspan="2">Cotton Valley [1]</th><th rowspan="2">Urania [2]</th><th rowspan="2">Calion below 24° [3]</th><th colspan="5">Smackover [1]</th><th colspan="6">Stephens [4]</th></tr>
<tr><th>Below 24°</th><th>24–24.9°</th><th>25–25.9°</th><th>26–26.9°</th><th>27° and above</th><th>Below 28°</th><th>28–28.9°</th><th>29–29.9°</th><th colspan="3">30° and above</th></tr>
<tr><td>Jan. 1</td><td>$1.40</td><td>$1.20</td><td>$1.10</td><td>$1.10</td><td>$1.10</td><td>$1.35</td><td>$1.40</td><td>$1.45</td><td>$1.50</td><td>$1.30</td><td>$1.40</td><td>$1.45</td><td colspan="3">$1.50</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>30–30.9°</td><td>31–31.9°</td><td>32° and above</td></tr>
<tr><td>Feb. 11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>$1.50</td><td>$1.55</td><td>$1.60</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="4">24° and above</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Feb 24</td><td>1.25</td><td>1.10</td><td></td><td></td><td></td><td colspan="4">$1.25</td><td>1.10</td><td>1.20</td><td>1.24</td><td>1.28</td><td>1.32</td><td>1.36</td></tr>
<tr><td>Mar. 8</td><td></td><td></td><td></td><td></td><td></td><td colspan="4"></td><td></td><td>1.13</td><td>1.16</td><td>1.19</td><td>1.22</td><td>1.25</td></tr>
<tr><td>Mar. 14</td><td></td><td></td><td></td><td></td><td></td><td colspan="4"></td><td>1.00</td><td>1.02</td><td>1.04</td><td>1.06</td><td>1.08</td><td>1.10</td></tr>
<tr><td>Mar. 16</td><td></td><td></td><td>1.00</td><td></td><td></td><td colspan="4"></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mar. 17</td><td></td><td>1.00</td><td></td><td>1.00</td><td>1.00</td><td colspan="4"></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sept. 14</td><td></td><td></td><td>.90</td><td></td><td></td><td colspan="4"></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sept. 20</td><td></td><td></td><td></td><td>.90</td><td>.90</td><td colspan="4">1.15</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Nov. 18</td><td></td><td></td><td>.75</td><td></td><td></td><td colspan="4"></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Nov. 21</td><td></td><td></td><td></td><td>.85</td><td>85</td><td colspan="4">1.00</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Dec. 2</td><td></td><td>.85</td><td></td><td></td><td></td><td colspan="4"></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Average for year</td><td>1.27</td><td>1.02</td><td>.97</td><td>.99</td><td>.99</td><td colspan="4"></td><td>1.05</td><td>1.08</td><td>1.11</td><td>1.13</td><td>1.15</td><td>1.17</td></tr>
</table>

[1] Standard Oil Co. of Louisiana.

[2] Louisiana Oil and Refining Corporation.

[3] Gulf Refining Co. of Louisiana.

[4] Atlantic Oil Producing Co.

Date	Gulf coast field																					
	Coastal Texas[1]																			Coastal Louisiana[2]		
	Batson, Saratoga	Grade A	Grade B																Markham[3]	Edgerley, Vinton	Jennings	Starks
			Below 25°	25–25.9°	26–26.9°	27–27.9°	28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°	37–37.9°	38–38.9°	39–39.9°	40° and above				
Jan. 1	$1.40	$1.40	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85	$1.90	$1.95	$2.00	$2.05	$2.10	$2.15	$2.20	------	$1.40	$1.15	------
Feb. 10	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	$1.15	------	------	------
Mar. 2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	$1.40
Mar. 7[4]	1.30	1.30	1.25	1.28	1.31	1.34	1.37	1.40	1.43	1.46	1.49	1.52	1.55	1.58	1.61	1.64	1.67	1.70	1.73	------	1.30	------	1.30
Mar. 14	1.20	1.20	1.15	1.17	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.39	1.41	1.43	1.45	1.47	1.00	1.20	------	1.20
Average for year	1.24	1.24	1.20	1.22	1.25	1.27	1.30	1.32	1.35	1.38	1.40	1.43	1.45	1.48	1.50	1.53	1.55	1.58	1.60	------	1.24	1.15	1.21

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[1] Gulf Pipe Line Co. except as noted.
[2] Gulf Refining Co. of Louisiana.
[3] The Texas Co. On gravity basis prior to Feb. 10.
[4] Met by The Texas Co. and Sun Pipe Line Co. Mar. 8.

Posted price per barrel of petroleum at wells in 1927, by grades, with dates of change—Continued

Date	Rocky Mountain field [1]																				
	Byron	Big Muddy, Rock Creek	Cat Creek, Elk Basin, Greybull, Torchlight, Lance Creek, Osage	Grass Creek		Hamilton Dome	Lake Basin	Lander and Simpson Ridge[2]	Lost Soldier[2]	Mule Creek	Pilot Butte	Rex-Lake	Salt Creek								
				Light	Heavy								28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°
Jan. 1	$2.25	$1.85	$2.00	$2.00	$0.90	$1.35	$2.40	$0.85	$1.35	$1.45	$1.7514	$1.25	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85	$1.90
Feb. 22													1.35	1.39	1.43	1.47	1.51	1.55	1.59	1.63	1.67
Feb. 23		1.62	1.75	1.75				.80	1.15	1.30		1.10									
Mar. 5													1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47
Mar. 7		1.42	1.55	1.55					1.05												
Mar. 12		1.25	1.33	1.33									1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.28
Mar. 14									.95												
Aug. 1							1.23														
Average for year	2.25	1.35	1.44	1.44	.90	1.35	1.91	.81	1.02	1.19	1.75	1.12	1.18	1.21	1.23	1.26	1.28	1.31	1.33	1.36	1.38

Date	Rocky Mountain field—Continued																			
	Salt Creek—Continued																Sunburst	Artesia	Hogback	Florence
	37–37.9°	38–38.9°	39–39.9°	40–40.9°	41–41.9°	42–42.9°	43–43.9°	44–44.9°	45–45.9°	46–46.9°	47–47.9°	48–48.9°	49–49.9°	50–50.9°	51–51.9°	52° and above				
Jan. 1	$1.95	$2.00	$2.05	$2.10	$2.15	$2.20	$2.25	$2.30	$2.35	$2.40	$2.45	$2.50	$2.55	$2.60	$2.65	$2.70	$1.35	$1.65	$2.05	$1.60
Feb. 22	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	2.03	2.07	2.11	2.15	2.19	2.23	2.27	2.31				
Feb. 23																		1.40	1.80	
Mar. 5	1.50	1.53	1.56	1.59	1.62	1.65	1.68	1.71	1.74	1.77	1.80	1.83	1.86	1.89	1.92	1.95				
Mar. 7																		1.20	1.60	
Mar. 12	1.30	1.32	1.34	1.36	1.38	1.40	1.42	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60		1.00	1.38	
Average for year	1.41	1.43	1.46	1.48	1.51	1.53	1.56	1.58	1.61	1.63	1.66	1.68	1.71	1.73	1.76	1.78	1.35	1.11	1.49	1.60

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[1] The Ohio Oil Co. and Midwest Refining Co.

[2] Producers and Refiners Corporation.

Field and date of change	California [1]													
	14–14.9°	15–15.9°	16–16.9°	17–17.9°	18–18.9°	19–19.9°	20–20.9°	21–21.9°	22–22.9°	23–23.9°	24–24.9°	25–25.9°	26–26.9°	27–27.9°
Huntington Beach-Long Beach-Seal Beach:														
Jan. 1	$0.85	$0.87	$0.90	$0.94	$0.98	$1.04	$1.10	$1.16	$1.22	$1.28	$1.34	$1.40	$1.46	$1.52
Apr. 1		.85	.85	.85	.85	.85	.85	.86	.87	.88	.89	.90	.92	.94
Average for year	.85	.85	.86	.87	.88	.90	.91	.93	.96	.98	1.00	1.02	1.05	1.08
Athens-Dominguez-Rosecrans:														
Jan. 1											1.34	1.40	1.46	1.52
Apr. 1											.89	.90	.92	.94
Average for year											1.00	1.02	1.05	1.08
Sante Fe Springs:														
Jan. 1							.89	.91	.94	.97	1.02	1.08	1.16	1.24
Apr. 1								.85	.85	.85	.85	.86	.87	.88
Average for year							.89	.86	.87	.88	.89	.91	.94	.97
Inglewood-Torrance:														
Jan. 1	.85	.87	.90	.94	.98	1.04	1.10	1.16	1.22	1.28	1.34	1.40	1.46	1.52
Apr. 1		.85	.85	.85	.85	.85	.85	.86	.87	.88	.89	.90	.92	.94
Average for year	.85	.85	.86	.87	.88	.90	.91	.93	.96	.98	1.00	1.02	1.05	1.08
Richfield-Brea Olinda:														
Jan. 1	.85	.87	.90	.94	.98	1.04	1.10	1.16	1.22	1.28	1.34	1.40	1.46	1.52
Apr. 1		.85	.85	.85	.85	.85	.85	.86	.87	.88	.89	.90	.92	.94
Average for year	.85	.85	.86	.87	.88	.90	.91	.93	.96	.98	1.00	1.02	1.05	1.08
Whittier-La Habra:														
Jan. 1	.85	.85	.85	.85	.86	.87	.89	.91	.94					
Apr. 1					.85	.85	.85	.85	.85					
Average for year	.85	.85	.85	.85	.85	.85	.86	.86	.87					
Montebello:														
Jan. 1	.85	.85	.85	.85	.86	.87	.89	.91	.94	.97	1.01	1.05	1.09	1.13
Apr. 1					.85	.85	.85	.85	.85	.85	.85	.86	.87	.88
Average for year	.85	.85	.85	.85	.85	.85	.86	.86	.87	.88	.89	.91	.92	.94

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[1] Standard Oil Co. of California.

Posted price per barrel of petroleum at wells in 1927, by grades, with dates of change—Continued

Field and date of change	California—Continued													
	14–14.9°	15–15.9°	16–16.9°	17–17.9°	18–18.9°	19–19.9°	20–20.9°	21–21.9°	22–22.9°	23–23.9°	24–24.9°	25–25.9°	26–26.9°	27–27.9°
Coalinga:														
Jan. 1	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.79	$0.86	$0.93	$1.00	$1.07	$1.11	$1.21	$1.28
Apr. 1							.76	.77	.78	.80	.80	.81	.83	.85
Average for year	.75	.75	.75	.75	.75	.75	.77	.79	.82	.84	.87	.88	.92	.96
Midway-Sunset-Elk Hills:														
Jan. 1	.75	.75	.75	.75	.75	.75	.82	.90	1.00	1.11	1.22	1.33	1.44	1.55
Apr. 1							.77	.79	.81	.83	.85	.87	.89	.91
Average for year	.75	.75	.75	.75	.75	.75	.78	.82	.86	.90	.94	.98	1.03	1.07
Lost Hills-Belridge:														
Jan. 1	.75	.75	.75	.75	.75	.75	.82	.90	1.00	1.11	1.22	1.33	1.44	1.55
Apr. 1							.77	.79	.81	.83	.85	.87	.89	.91
Average for year	.75	.75	.75	.75	.75	.75	.78	.82	.86	.90	.94	.98	1.03	1.07
Coyote:														
Jan. 1	.85	.85	.85	.85	.86	.87	.90	.98	1.06	1.14	1.22	1.30	1.38	1.46
Apr. 1					.85	.85	.85	.86	.87	.88	.89	.90	.91	.92
Average for year	.85	.85	.85	.85	.85	.85	.86	.89	.92	.94	.97	1.00	1.03	1.05
Wheeler Ridge:														
Jan. 1	.75	.75	.75	.75	.75	.75	.78	.81	.85	.89	.93	.97	1.01	1.05
Apr. 1							.76	.77	.78	.79	.80	.81	.82	.83
Average for year	.75	.75	.75	.75	.75	.75	.76	.78	.80	.81	.83	.85	.87	.88
Newhall-McKittrick-Kern River-Buena Vista:														
Jan. 1	.75	.75	.75	.75	.75	.75								
Average for year	.75	.75	.75	.75	.75	.75								
Santa Maria[2]														
Jan. 1	.85	.85	.85	.85	.85	.85	.90	.97	1.04	1.11	1.18	1.25	1.32	1.39
Apr. 1							.85	.85	.85	.85	.85	.86	.87	.88
Average for year	.85	.85	.85	.85	.85	.85	.86	.88	.90	.91	.93	.96	.98	1.01

Salt Lake:[2]														
Jan. 1	.85	.85	.85	.85	.85	.85	------	------	------	------	------	------	------	------
Average for year	.85	.85	.85	.85	.85	.85	------	------	------	------	------	------	------	------
Ventura:[2]														
Jan. 1	.85	.85	.85	.85	.85	.85	.90	.97	1.04	1.11	1.18	1.25	1.32	1.39
Apr. 1	------	------	------	------	------	------	.85	.85	.85	.85	.85	.86	.87	.88
Average for year	.85	.85	.85	.85	.85	.85	.86	.88	.90	.91	.93	.96	.98	1.01

Field and date of change	California—Continued														
	28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°	37–37.9°	38–38.9°	39–39.9°	40–40.9°	41–41.9°	42° and above
Huntington Beach-Long Beach-Seal Beach:															
Jan. 1	$1.58	$1.64	$1.70	$1.76	$1.84	------	------	------	------	------	------	------	------	------	------
Apr. 1	.96	.98	1.00	1.03	1.06	------	------	------	------	------	------	------	------	------	------
Average for year	1.11	1.14	1.17	1.21	1.25	------	------	------	------	------	------	------	------	------	------
Athens-Dominguez-Rosecrans:															
Jan. 1	1.58	1.64	1.70	1.76	1.84	$1.92	$2.00	$2.08	$2.16	$2.24	$2.34	$2.44	$2.54	$2.64	$2.74
Apr. 1	.96	.98	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36
Average for year	1.11	1.14	1.17	1.21	1.25	1.29	1.34	1.38	1.42	1.46	1.51	1.56	1.61	1.65	1.70
Sante Fe Springs:															
Jan. 1	1.32	1.40	1.48	1.60	1.72	1.84	1.96	2.08	2.16	2.24	2.34	2.44	------	------	------
Apr. 1	.89	.91	.93	.95	.97	.99	1.01	1.03	1.06	1.09	1.12	1.15	------	------	------
Average for year	1.00	1.03	1.07	1.11	1.15	1.20	1.24	1.29	1.33	1.37	1.42	1.47	------	------	------
Inglewood-Torrance:															
Jan. 1	1.58	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Apr. 1	.96	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Average for year	1.11	------	------	------	------	------	------	------	------	------	------	------	------	------	------

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[2] Union Oil Co.

Posted price per barrel of petroleum at wells in 1927, by grades, with dates of change—Continued

Field and date of change	California—Continued														
	28–28.9°	29–29.9°	30–30.9°	31–31.9°	32–32.9°	33–33.9°	34–34.9°	35–35.9°	36–36.9°	37–37.9°	38–38.9°	39–39.9°	40–40.9°	41–41.9°	42° and above
Richfield-Brea Olinda:															
Jan. 1	$1.58	$1.64	$1.70												
Apr. 1	.96	.98	1.00												
Average for year	1.11	1.14	1.17												
Whittier-La Habra:															
Jan. 1															
Apr. 1															
Average for year															
Montebello:															
Jan. 1	1.17	1.21	1.25												
Apr. 1	.89	.90	.91												
Average for year	.96	.98	.99												
Coalinga:															
Jan. 1	1.35	1.42	1.49	$1.56	$1.63	$1.70	$1.77	$1.84							
Apr. 1	.87	.89	.91	.93	.95	.97	.99	1.01							
Average for year	.99	1.02	1.05	1.09	1.12	1.15	1.18	1.21							
Midway-Sunset-Elk Hills:															
Jan. 1	1.66	1.77	1.88	1.99	2.10	2.21									
Apr. 1	.93	.96	.99	1.02	1.05	1.08									
Average for year	1.11	1.16	1.21	1.26	1.31	1.36									
Lost Hills-Belridge:															
Jan. 1	1.66	1.77	1.88	1.99	2.10	2.21	2.32								
Apr. 1	.93	.96	.99	1.02	1.05	1.08	1.11								
Average for year	1.11	1.16	1.21	1.26	1.31	1.36	1.41								

Coyote:															
Jan. 1	1.54	1.62	1.70	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Apr. 1	.93	.94	.95	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Average for year	1.08	1.11	1.13	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Wheeler Ridge:															
Jan. 1	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Apr. 1	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Average for year	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Newhall-McKittrick-Kern River-Buena Vista:															
Jan. 1	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Average for year	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Santa Maria:[3]															
Jan. 1	1.46	1.53	1.60	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Apr. 1	.89	.91	.93	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Average for year	1.03	1.06	1.10	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Salt Lake:[3]															
Jan. 1	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Average for year	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Ventura:[3]															
Jan. 1	1.46	1.53	1.60	1.67	1.73	1.79	1.85	1.92	--------	--------	--------	--------	--------	--------	--------
Apr. 1	.89	.91	.93	.95	.97	.99	1.01	1.03	$1.06	$1.09	$1.12	$1.15	--------	--------	--------
Average for year	1.03	1.06	1.10	1.13	1.16	1.19	1.22	1.25	1.27	1.29	1.32	1.34	--------	--------	--------

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[3] Union Oil Co.

WELLS

From the official beginning of the industry in 1859 to 1927 over 740,000 wells were drilled for oil and gas in the United States, of which nearly 152,000, or 20 per cent, were dry holes.

The drastic cuts in the price of crude petroleum the latter part of 1926 and early part of 1927 severely curtailed drilling in all but the new flush fields, and in consequence completions fell from 29,319 in 1926 to 24,143 in 1927. Of the wells completed in 1927, 14,442, or 60 per cent, were oil wells; 2,491, or 10 per cent, were gas wells; and the remainder, 7,210, or 30 per cent, were dry holes. These figures indicate an increase in the percentage of both dry holes and gas wells. The percentage of dry holes—that is, 30—is the highest figure recorded for any year beginning with 1908 and probably for all previous years. Completions in 1927 reached the maximum in April and from then on declined rather steadily. In December only 857 oil wells were completed, as compared with 1,511 in April.

The average daily production per well in 1927 was 7.7 barrels, as compared with 6.8 barrels in 1926 and 6.9 barrels in 1925. The increase over 1926 was a reflection of the great number of large wells completed in 1927 at Seminole and in west Texas. The average production per day of the wells in California in 1927 was 55.9 barrels, the highest figure recorded for any of the States. The average daily production of the wells in Oklahoma increased from 8.1 barrels in 1926 to 12.3 barrels in 1927. This material increase was the chief factor in the increase in national output.

The majority of the States and fields recorded decreases in completions in 1927, although certain flush areas made notable gains. Those showing outstanding decreases were as follows: Arkansas, particularly the Smackover field; the central States of Illinois, Ohio, and Kentucky; Kansas, particularly Greenwood County; Oklahoma, practically all the older fields; Texas, Archer County; and Wyoming, the Salt Creek field. Those showing the most notable increases were: The Huntington Beach, Kern River, and Seal Beach fields of California; the Seminole district of Oklahoma; the Bradford district of New York and Pennsylvania; and west Texas. As an illustration of the importance of the Kevin-Sunburst field to Montana, only six oil wells out of a total of 243 were completed outside of this field in 1927. Some of the States, notably Kansas and Texas, compensated for declines in number of wells by increases in average initial production per well. In the west Texas district the average initial production per well in 1927 was 1,590 barrels, an exceptionally high figure.

Approximate number of producing oil wells in the United States, December 31, 1925–1927

State	1925		1926		1927	
	Approximate number of wells	Average production per well per day (barrels) [1]	Approximate number of wells	Average production per well per day (barrels) [1]	Approximate number of wells	Average production per well per day (barrels)
Arkansas	4,100	59.3	4,500	37.2	4,550	24.2
California [2]	[2] 11,070	56.9	[2] 11,330	55.0	[2] 11,280	55.9
Colorado	80	44.8	130	72.2	170	51.7
Illinois	16,280	1.3	16,270	1.3	16,240	1.2
Indiana:						
Southwestern	990	1.8	990	1.8	1,100	1.9
Northeastern	1,010	.5	1,060	.4	960	.3
Total Indiana	2,000	1.1	2,050	1.1	2,060	1.1
Kansas	18,600	5.7	19,230	6.0	19,600	5.8
Kentucky	13,100	1.4	13,300	1.3	13,500	1.4
Louisiana:						
Gulf coast	260	38.4	240	45.4	250	56.5
Northern	3,490	13.7	3,950	14.0	4,000	12.2
Total Louisiana	3,750	15.2	4,190	16.0	4,250	14.8
Michigan	(3)	------------	90	5.3	300	6.2
Montana	590	23.1	830	29.8	980	15.3
New Mexico	140	32.3	230	24.7	250	14.0
New York	15,580	.3	16,150	.3	16,740	.4
Ohio:						
Central and eastern	21,120	.7	21,150	.7	20,100	.8
Northwestern	17,940	.3	18,100	.3	17,500	.3
Total Ohio	39,060	.5	39,250	.5	37,600	.5
Oklahoma	59,400	8.1	61,600	8.1	61,750	12.3
Pennsylvania	75,900	.3	76,800	.3	78,480	.3
Texas:						
Gulf coast	2,430	35.2	2,520	45.5	2,600	50.3
Rest of State	20,970	16.1	26,510	14.5	29,400	16.7
Total Texas	23,400	18.1	29,030	17.4	32,000	19.5
West Virginia	19,940	.8	20,150	.8	19,900	.8
Wyoming	3,080	28.3	3,400	21.8	3,560	16.8
Other	[4] 30	------------	[5] 70	------------	[5] 90	------------
United States	306,100	6.9	318,600	6.8	323,300	7.7

[1] Revised figures.

[2] American Petroleum Institute; does not include wells temporarily shut in.

[3] Included under "Other."

[4] Alaska, Michigan, Tennessee, and Utah.

[5] Alaska, Tennessee, and Utah.

Wells drilled for oil and gas in the United States, 1859–1927

Year	Wells completed	Dry holes		Year	Wells completed	Dry holes		Year	Wells completed	Dry holes	
		Total	Percentage			Total	Percentage			Total	Percentage
1859–1907	[1] 287,922	[1] 54,940	19	1915	14,157	2,981	21	1923	24,438	5,883	24
1908	16,909	3,214	19	1916	24,619	4,039	16	1924	21,888	5,044	23
1909	18,327	3,404	19	1917	23,407	4,851	21	1925	25,623	6,734	26
1910	14,940	2,422	16	1918	25,687	5,613	22	1926	29,319	7,965	27
1911	13,768	2,363	17	1919	20,173	5,986	21	1927	24,143	7,210	30
1912	17,180	2,855	17	1920	33,911	7,364	22				
1913	25,590	4,282	17	1921	21,937	5,160	24		740,764	151,784	20
1914	23,137	4,142	18	1922	24,689	5,332	22				

[1] From Papers on the Conservation of Mineral Resources, U. S. Geol. Survey Bull. 394, 1909, pp. 30–50.

Wells drilled for oil and gas in the United States, 1926–27, by months [1]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year	
													Total	Percentage
1926														
Oil	1,168	1,133	1,307	1,463	1,515	1,697	1,856	1,858	1,745	1,962	1,749	1,560	19,013	65
Gas	192	175	194	190	173	185	208	209	178	194	231	212	2,341	8
Dry	603	499	623	573	695	665	879	737	656	698	694	643	7,965	27
	1,963	1,807	2,124	2,226	2,383	2,547	2,943	2,804	2,579	2,854	2,674	2,415	29,319	100
1927														
Oil	1,383	1,287	1,348	1,511	1,273	1,240	1,276	1,132	1,048	1,049	1,038	857	14,442	60
Gas	187	182	185	191	183	181	190	204	267	236	270	215	2,491	10
Dry	588	540	595	709	610	564	677	552	574	572	687	542	7,210	30
	2,158	2,009	2,128	2,411	2,066	1,985	2,143	1,888	1,889	1,857	1,995	1,614	24,143	100

[1] California dry gas wells not reported.

Wells drilled for oil and gas in the United States in 1927, by States and by counties or districts [1]

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Arkansas:					
Bradley			3	3	
Columbia			15	15	
Miller			4	4	
Nevada	43	3	9	55	95
Ouachita	42	9	22	73	58
Union	85	33	73	191	95
Miscellaneous		1	17	18	
	170	46	143	359	86
Total, 1926	737	65	226	1,028	101
California:					
Coalinga	9	(2)	3	12	63
Coyote	6		2	8	138
Dominguez	9		3	12	317
Elk Hills	1			1	25
Fullerton	15		1	16	449
Goleta	8		3	11	327
Huntington Beach	209		10	219	352
Inglewood	17		2	19	221
Kern River	121		9	130	178
Long Beach	48		22	70	1,047
Lost Hills-Belridge	3			3	111
McKittrick	13			13	33
Midway-Sunset	91		16	107	136
Montebello	6		1	7	193
Mount Poso	6		7	13	496
Potrero	1			1	500
Richfield	72		6	78	272
Rincon	2			2	938
Rosecrans	9		13	22	441
Round Mountain	1		1	2	500
Santa Fe Springs	4		1	5	236
Santa Maria	6		4	10	279
Seal Beach	169		24	193	1,209
Torrance	12		1	13	100
Ventura Avenue	40			40	1,575
Ventura Newhall	15		26	41	124
Wheeler Ridge	3			3	90
Whittier	1		4	5	60
Miscellaneous	4		122	126	13
	901	(2)	281	1,182	533
Total, 1926	913	(2)	284	1,197	429

[1] For States east of California, Oil and Gas Journal; for California, American Petroleum Institute.

[2] Not reported.

Wells drilled for oil and gas in the United States in 1927, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Colorado:					
Fremont	31	----------	27	58	73
Jackson	1	----------	2	3	1,500
La Plata	1	----------	2	3	2
Larimer	11	1	----------	12	229
Las Animas	----------	3	----------	3	----------
Moffat	6	2	4	12	925
Pueblo	1	----------	3	4	25
Routt	6	----------	5	11	189
Miscellaneous	3	1	10	14	20
	60	7	53	120	217
Total, 1926	46	5	38	89	358
Illinois:					
Clark	9	----------	12	21	26
Crawford	18	3	9	30	6
Cumberland	2	----------	1	3	2
Lawrence	26	1	2	29	34
Marion	1	----------	2	3	9
McDonough	1	----------	2	3	15
Morgan	2	2	3	7	18
Wabash	29	2	27	58	33
Miscellaneous	----------	----------	7	7	----------
	88	8	65	161	26
Total, 1926	231	7	125	363	34
Indiana:					
Northeastern—					
Adams	16	1	6	23	18
Huntington	1	----------	----------	1	25
Jay	13	----------	9	22	18
Miscellaneous	2	6	6	14	16
	32	7	21	60	18
Total, 1926	61	9	12	82	17
Southwestern—					
Daviess	18	1	22	41	40
Gibson	23	3	19	45	62
Knox	4	----------	1	5	16
Pike	19	2	24	45	17
Spencer	2	----------	2	4	11
Sullivan	5	----------	6	11	63
Vigo	4	1	3	8	85
Miscellaneous	1	17	9	27	3
	76	24	86	186	42
Total, 1926	83	15	50	148	36
Total, Indiana, 1927	108	31	107	246	35
1926	144	24	62	230	28
Kansas:					
Anderson	16	----------	4	20	56
Butler	114	1	72	187	99
Chase	3	16	13	32	17
Chautauqua-Elk	52	10	28	90	118
Cowley	56	17	43	116	111
Greenwood	190	5	130	325	101
Lyon	11	----------	20	31	115
Marion	8	----------	25	33	308
Miami	67	----------	71	138	57
Montgomery	20	9	7	36	19
Reno	1	----------	11	12	150
Rice	11	----------	7	18	233
Rooks	1	----------	----------	1	50
Russell	10	----------	10	20	89
Sumner	83	3	30	116	483
Woodson	16	3	16	35	147
Miscellaneous	26	15	82	123	16
	685	79	569	1,333	143
Total, 1926	1,458	96	784	2,338	119

Wells drilled for oil and gas in the United States in 1927, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Kentucky:					
Allen	28		19	47	37
Barren	181	3	78	262	12
Clinton	6		5	11	46
Cumberland-Monroe	17		11	28	52
Daviess	32		17	49	30
Estill	91		28	119	3
Floyd-Knott	1	22	1	24	10
Johnson-Magoffin	59		6	65	14
Lawrence-Johnson	6	1	1	8	8
Lee-Owsley	28	3	3	34	36
McCreary	2		3	5	9
McLean	1			1	100
Morgan	6			6	3
Ohio	243	4	91	338	92
Warren	54	2	29	85	9
Wayne	14		26	40	8
Wolfe	5		2	7	2
Miscellaneous	13	5	10	28	6
	787	40	330	1, 157	39
Total, 1926	949	48	280	1, 277	16
Louisiana:					
Gulf coast—					
Edgerley	23	1	6	30	656
Jennings	17	1	15	33	106
Lockport	33	1	4	38	932
Stark	3		3	6	900
Vinton	29		10	39	214
Miscellaneous	10		46	56	381
	115	3	84	202	526
Total, 1926	111		59	170	371
Northern—					
Bossier	19	30	15	64	14
Caddo	139	41	79	259	199
Claiborne	3		10	13	5
De Soto	12	2	8	22	43
Grant	5		25	30	147
La Salle	33	2	23	58	111
Monroe		57	19	76	
Red River	8	1	4	13	47
Richland		23	13	36	
Sabine	23	3	14	40	279
Webster	10	17	11	38	51
Miscellaneous		1	76	77	
	252	177	297	726	160
Total, 1926	607	118	321	1, 046	135
Total Louisiana, 1927	367	180	381	928	275
1926	718	118	380	1, 216	172
Michigan:					
Macomb	1			1	3
Muskegon	1		1	2	20
Saginaw	213	1	24	238	20
Shiawassee	1		5	6	9
Van Buren	1		1	2	5
Miscellaneous		2	13	15	
	217	3	44	264	20
Total, 1926	89		16	105	21
Montana:					
Cat Creek	3		2	5	36
Fallon		7	3	10	
Kevin-Sunburst	237	41	142	420	123
Liberty		4	1	5	
Pondera		1	8	9	
Stillwater	1	1	4	6	100
Teton	2		9	11	45
Miscellaneous			27	27	
	243	54	196	493	121
Total, 1926	266	29	155	450	198

Wells drilled for oil and gas in the United States in 1927, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
New Mexico:					
Chaves	2		7	9	5
Eddy	22	2	19	43	44
Lea	3		5	8	173
McKinley	6	1	10	17	63
San Juan	8	3	12	23	134
Miscellaneous			13	13	
	41	6	66	113	72
Total, 1926	120	1	66	187	83
Ohio:					
Central and eastern—					
Athens	32	16	18	66	3
Guernsey	71	50	30	151	66
Hocking	45	8	18	71	53
Holmes	78	63	28	169	41
Jefferson	17		6	23	4
Knox	11	17	19	47	30
Licking	145	4	13	162	17
Medina	29	20	19	68	3
Meigs	24	17	6	47	5
Muskingum	5	6	4	15	87
Noble	14	5	6	25	32
Perry	29	10	16	55	48
Washington	46	4	27	77	5
Miscellaneous	80	213	92	385	24
	626	433	302	1, 361	24
Total, 1926	812	484	348	1, 644	23
Northwestern—					
Allen	21			21	23
Auglaize	33	1	9	43	19
Darke	6		1	7	13
Hancock	20	1	5	26	19
Hardin	11	2	1	14	21
Mercer	25	3	3	31	9
Ottawa	16	3	3	22	11
Sandusky	19		1	20	8
Seneca	6		5	11	13
Shelby	12		1	13	10
Wood	38	1	5	44	9
Miscellaneous	4	5	1	10	14
	211	16	35	262	14
Total, 1926	413	13	34	460	17
Total Ohio, 1927	837	449	337	1, 623	21
1926	1, 225	497	382	2, 104	21
Oklahoma:					
Caddo	20	2	2	24	42
Carter	119	10	41	170	181
Creek	298	69	181	548	191
Garfield	33	2	26	61	206
Garvin	28	6	20	54	310
Grady	126	79	60	265	153
Hughes	20	7	24	51	153
Jefferson	3	1	10	14	48
Kay	105	50	74	229	404
Lincoln	21	3	16	40	252
Muskogee-Wagoner	50	41	144	235	37
Okfuskee	31	22	46	99	426
Osage	228	56	115	399	279
Pawnee	13	8	70	91	165
Payne	15	5	15	35	549
Pontotoc	17	5	5	27	149
Pottawatomie	128	8	35	171	1, 681
Seminole	1, 010	15	235	1, 260	1, 458
Stephens-Cotton	75	21	67	163	196
Tulsa	52	17	55	124	81
Miscellaneous	170	81	202	453	46
	2, 562	508	1, 443	4, 513	769
Total, 1926	3, 119	498	1, 735	5, 352	316
Pennsylvania and New York:					
Allegany	481	6	5	492	3
Bradford	1, 788	3	4	1, 795	2
Butler-Armstrong	65	34	22	121	2

Wells drilled for oil and gas in the United States in 1927, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Pennsylvania and New York—Continued.					
Middle Field	50	5	2	57	2
Venango-Clarion	236	53	20	309	1
Southwestern Pennsylvania—					
Allegheny	11	11	10	32	3
Beaver	6	8	10	24	2
Greene	21	52	22	95	37
Washington	13	18	10	41	10
	2,671	190	105	2,966	3
Total, 1926	2,370	195	151	2,716	4
Tennessee:					
Clay	34	1	9	44	70
Jackson	10		3	13	141
Overton	1		2	3	20
Pickett	3		1	4	28
Putnam	1			1	50
Miscellaneous		1	1	2	
	49	2	16	67	81
Total, 1926	26	1	8	35	130
Texas:					
Gulf coast—					
Barbers Hill	13		5	18	502
Batson	23		17	40	39
Big Creek	23		4	27	1,252
Blue Ridge	44		15	59	729
Boling	22		60	82	184
Goose Creek	28		13	41	159
High Island	3		6	9	477
Hull	64		20	84	566
Humble	7		10	17	512
Markham	8	2	5	15	131
Nash	9		3	12	394
Orange	42		10	52	282
Orchard	1		2	3	2,300
Pierce Junction	65	3	11	79	1,063
Saratoga	7		4	11	13
Sourlake	21		6	27	231
South Liberty	17		7	24	203
Spindletop	129		51	180	1,859
West Columbia	4		3	7	778
Miscellaneous	19	8	129	156	205
	549	13	381	943	840
Total, 1926	711		371	1,082	950
Rest of State—					
North, central, and eastern—					
Adams		33	9	42	
Archer	231		260	491	75
Brown	594	16	289	899	251
Callahan	46	3	93	142	97
Cherokee	1	1	8	10	200
Cooke	123	5	59	187	107
Dale	17		15	32	220
Eastland	111	19	82	212	214
Kingsville	4	4	11	19	166
Limestone	14	2	20	36	333
Luling	43		1	44	47
Mirando	81	87	123	291	50
Montague	175	11	56	242	38
Palo Pinto	6	8	15	29	50
Panola	8	12	6	26	22
Refugio		24	3	27	
Rockdale-Minerva	82		21	103	21
Shackelford	115	3	129	247	92
Somerset	45		3	48	8
Stephens	28	13	30	71	66
Throckmorton	26	2	38	66	74
Wichita	194		198	392	43
Wilbarger	150	1	48	199	82
Young	115		144	259	267
Miscellaneous	69	102	471	642	77
	2,278	346	2,132	4,756	133
Total, 1926	3,935	230	2,429	6,594	127

Wells drilled for oil and gas in the United States in 1927, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Texas—Continued.					
Rest of State—Continued.					
Panhandle—					
Carson	103	20	7	130	304
Gray	105	9	14	128	374
Hutchinson	387	32	14	433	252
Moore	3	8	1	12	155
Wheeler	25	23	8	56	373
Miscellaneous		2	43	45	
	623	94	87	804	286
Total, 1926	764	32	35	831	487
West Texas—					
Crane	174		13	187	1, 400
Crockett	11		13	24	2, 589
Howard	87	2	17	106	91
Jones	16		29	45	344
Mitchell	29		8	37	87
Pecos	97		29	126	5, 944
Reagan	47	2	7	56	282
Runnels	1		3	4	200
Upton	159		30	189	487
Winkler	40	2	8	50	2, 509
Miscellaneous	5		86	91	636
	666	6	243	915	1, 590
Total, 1926	378	1	139	518	364
Total "Rest of State," 1927	3, 567	446	2, 462	6, 475	432
1926	5, 077	263	2, 603	7, 943	199
Total Texas, 1927	4, 116	459	2, 843	7, 418	486
1926	5, 788	263	2, 974	9, 025	291
Utah:					
San Juan		1	6	7	
Miscellaneous			7	7	
		1	13	14	
Total, 1926		1	1	2	
West Virginia:					
Boone	4	50	2	56	18
Calhoun	14	43	7	64	4
Clay	62	27	7	96	14
Doddridge	15	22	9	46	8
Lincoln		48	1	49	
Marion	4	22	11	37	19
Marshall	11	11	6	28	9
Mingo	8	5	1	14	29
Pleasants	14	5	19	38	5
Ritchie	38	43	22	103	31
Roane	21	11	6	38	10
Wetzel-Tyler	32	25	14	71	14
Wood	16		25	41	11
Miscellaneous	33	96	30	159	2
	272	408	160	840	13
Total, 1926	416	475	211	1, 102	17
Wyoming:					
Big Horn Basin	8	4	14	26	138
Big Muddy-Converse	13		1	14	74
Carbon-Sweetwater	12	7	10	29	285
Fremont	8	4	7	19	232
Lincoln-Sublette-Uinta	32	1	6	39	76
Natrona	1			1	180
Niobrara	3			3	132
Osage-Weston	4	3	2	9	25
Salt Creek	187		9	196	660
Miscellaneous			3	3	
	268	19	52	339	499
Total, 1926	398	17	78	493	241
Other States, 1927[3]		1	6	7	
1926[3]		1	9	10	
United States, 1927	14, 442	[4] 2, 491	7, 210	[4] 24, 143	341
1926	19, 013	[4] 2, 341	7, 965	[4] 29, 319	194

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[3] 1926, Alabama and Mississippi; 1927, Florida and Mississippi.

[4] California dry gas wells not reported.

GRAVITY OF CRUDE PETROLEUM

Estimated average gravity of crude petroleum from various fields in the United States in 1927

District or grade	Degrees A. P. I.	Specific gravity
Alaska: Katalla	44.0	0.806
Arkansas:		
Bradley	26.4	.896
El Dorado	34.4	.853
Irma	14.4	.970
Lisbon	34.0	.855
Smackover—		
Heavy	19.8	.935
Light	25.9	.899
Stephens	29.0	.882
Average	21.6	.924
California:		
Arroyo Grande	14.8	.967
Bardsdale	30.6	.873
Beverly Hills	18.5	.943
Casmalia	6.8	1.023
Cat Canyon	15.9	.960
Coalinga	19.4	.938
Conejo	14.4	.970
Coyote Hills	25.0	.904
Dominguez	31.0	.871
Elk Hills	22.5	.919
Fullerton	22.4	.919
Goleta	42.0	.816
Half Moon Bay	44.3	.805
Huntington Beach	25.6	.901
Inglewood	18.4	.944
Kern River	14.1	.972
Lompoc	20.0	.934
Long Beach	25.8	.900
Los Angeles	15.5	.963
Lost Hills-Belridge	25.5	.901
McKittrick	14.8	.967
Midway-Sunset	19.0	.940
Montebello	23.0	.916
Mount Poso	15.5	.963
Newhall	22.0	.922
Newport Beach	12.3	.984
Ojai	17.1	.952
Petaluma	19.7	.937
Piru	23.4	.914
Richfield	22.3	.920
Rincon	30.0	.876
Rosecrans	37.8	.836
Round Mountain	18.2	.945
Salt Lake	14.8	.967
Santa Fe Springs	33.2	.859
Santa Maria	23.0	.916
Santa Paula	24.0	.910
Sargent	17.1	.952
Seal Beach	24.2	.909
Sespe	26.7	.894
Simi	32.3	.864
South Mountain	28.2	.886
Summerland	13.6	.975
Torrance	20.7	.930
Ventura Avenue	30.2	.875
Wheeler Ridge	25.3	.902
Whittier	19.1	.940
Average	24.1	.909
Colorado:		
Canon City	32.0	.865
Florence	29.3	.880
Fort Collins	37.0	.840
Ilcs Dome	35.0	.850
Moffat	41.0	.820
Rangely	42.5	.813
Tow Creek	35.0	.850
Walden	51.0	.775
Average	37.2	.839
Illinois:		
"Illinois"	33.0	0.860
Plymouth	34.2	.854
Waterloo	30.0	.876
Average	33.0	.860
Indiana:		
Northeastern ("Indiana")	35.5	.846
Southwestern ("Princeton")	33.0	.860
Average	33.4	.858
Kansas:		
Altoona	32.1	.865
Anderson	35.0	.850
Augusta	34.0	.855
Big Sandy	23.0	.916
Chanute	29.7	.878
Churchill	36.0	.845
Dexter	34.0	.855
Eldorado	36.0	.845
Elbing	33.9	.856
Erie	31.1	.870
Graham	38.0	.835
Independence	34.0	.855
Iola	19.0	.940
Leon-Weaver	34.0	.855
Lost Springs	37.0	.840
Lyon County	22.0	.922
Madison	41.0	.820
Moline	37.0	.840
Neodesha	35.8	.846
New Albany	31.9	.866
Ossawatomie	27.2	.892
Paola-Rantoul	29.3	.880
Peabody	32.8	.861
Peru-Sedan	30.2	.875
Potwin	43.9	.807
Rainbow Bend	39.0	.830
Russell County	39.0	.830
Sallyards	37.2	.839
Seely	40.0	.825
Sumner County	38.0	.835
Teeter	36.8	.841
Urbana	30.0	.876
Virgil	38.0	.835
Wayside	28.4	.885
Winfield	38.0	.835
Yates Center	27.7	.889
Average	36.4	.843
Kentucky:		
Ohio County	35.0	.850
Olympia	36.0	.845
Ragland	23.2	.915
Rodemer	29.0	.882
Scottsville	35.0	.850
Somerset	37.6	.837
Warren County	36.0	.845
Average	35.8	.845
Louisiana:		
Gulf coast (salt domes)—		
Anse la Butte	24.0	.910
Edgerley	21.0	.928
Hackberry	21.0	.928
Iberia	21.0	.928
Jennings	24.3	.908
Lockport	24.8	.905
Starks	21.0	.928
Sulphur	20.9	.929
Sweet Lake	29.5	.879
Vinton	18.6	.943
Welsh	22.0	.922
Average	22.0	.922

Estimated average gravity of crude petroleum from various fields in the United States in 1927—Continued

District or grade	Degrees A. P. I.	Specific gravity
Louisiana—Continued.		
Rest of State—		
Bellevue	19.0	0.940
Bull Bayou	39.5	.828
Caddo—		
Heavy	26.5	.896
Light	40.1	.825
Cotton Valley	29.0	.882
De Soto	36.0	.845
Elm Grove	29.5	.879
Haynesville	35.0	.850
Homer	36.2	.844
Urania	21.0	.928
Average	32.2	.864
Average for State	29.9	.877
Michigan:		
Muskegon	37.0	.840
Saginaw	44.0	.806
Average	44.0	.806
Montana:		
Cat Creek	49.7	.781
Elk Basin	42.0	.816
Kevin-Sunburst	31.9	.866
Lake Basin	44.0	.806
Pondera	34.0	.855
Average	34.8	.851
New Mexico:		
Artesia	37.0	.840
Hogback	56.0	.755
Hospah	30.0	.876
Maljamar	33.0	.860
Rattlesnake	65.0	.720
Table Mesa	57.0	.751
Average	48.5	.786
New York	43.5	.809
Ohio:		
Northwestern ("Lima")	36.6	.842
Southeastern and Central—		
Cleveland	38.2	.834
Corning	40.0	.825
Pennsylvania grade	42.5	.813
Wooster	38.1	.834
Average	40.4	.823
Average for State	40.2	.824
Oklahoma:		
Allen	29.7	.878
Bald Hill	41.9	.816
Bigheart	35.8	.846
Bixby	37.0	.840
Blackwell	39.0	.830
Bowlegs	39.5	.828
Boynton	36.8	.841
Braman	41.0	.820
Bristow	34.0	.855
Broken Arrow	34.4	.853
Burbank	37.6	.837
Canary	31.7	.867
Cement	34.6	.852
Claremore	34.0	.855
Cleveland	36.8	.841
Comanche	33.7	.857
Cromwell	38.0	.835
Cushing	39.4	.828
Davenport	43.2	.810
Oklahoma—Continued.		
Deaner-Lyons	41.0	0.820
Deer Creek	40.0	.825
Duncan	35.4	.848
Earlsboro	40.0	.825
Fox	23.6	.912
Garber	45.6	.799
Glenn	34.0	.855
Graham	38.0	.835
Healdton	30.0	.876
Henryetta	36.6	.842
Hewitt	33.5	.858
Hominy	37.0	.840
Knox	36.7	.841
Little River	38.0	.835
Maramec	37.0	.840
Mounds	36.0	.845
Newkirk	41.0	.820
Papoose	38.0	.835
Pearson	38.0	.835
Pershing	35.8	.846
Ponca	40.0	.825
Robberson	25.0	.904
Searight	38.2	.834
Seminole City	39.0	.830
Sholem-Alechem	32.0	.865
Slick	33.0	.860
Thomas	42.0	.816
Tonkawa	42.0	.816
Wagoner	32.2	.864
Walters	33.3	.859
Wewoka	38.5	.832
Wheeler	21.7	.924
Yale-Quay	37.0	.840
Average	38.2	.834
Pennsylvania:		
Bradford	43.5	.809
Franklin	29.5	.878
Keister	32.5	.863
"Pennsylvania"	40.0	.825
Average	42.0	.816
Tennessee:		
Glen Mary	39.0	.830
Tinsleys Bottom	43.2	.810
Average	41.0	.820
Texas:		
Gulf coast (salt domes)—		
Barbers Hill	26.2	.897
Batson	20.6	.930
Big Creek	27.0	.893
Blue Ridge	30.0	.876
Boggy Creek	39.0	.830
Boling	29.1	.881
Damon Mound	22.1	.921
Fannette	31.8	.867
Goose Creek	24.0	.910
High Island	28.0	.887
Hull	25.0	.904
Humble	19.4	.938
Moore	34.5	.852
Orange	23.7	.912
Piedras Pintas	42.0	.816
Pierce Junction	23.5	.913
Saratoga	19.0	.940
Sourlake	26.0	.898
South Liberty	22.3	.920
Spindletop	26.0	.898
West Columbia	22.8	.917
Average	25.0	.904

Estimated average gravity of crude petroleum from various fields in the United States in 1927—Continued

District or grade	Degrees A. P. I.	Specific gravity
Texas—Continued.		
Rest of State—		
East and south central—		
Calliham	18.0	0.947
Corsicana	34.0	.855
Currie	42.0	.816
Luling	26.8	.894
Lytton Springs	38.0	.835
Mexia	35.6	.847
Minerva	38.5	.832
Nacogdoches	21.8	.923
Nigger Creek	38.5	.832
Powell	37.5	.837
Somerset	34.0	.855
Thrall	37.6	.837
Wortham	38.5	.832
Average	34.0	.855
North and central—		
Breckenridge	36.2	.844
Brownwood	34.0	.855
Burkburnett	37.4	.838
Caddo	37.2	.839
Desdemona	37.2	.839
Electra	40.2	.824
Holliday	37.2	.839
Moran	39.0	.830
Nocona	22.0	.922
Noodle Creek	40.5	.823
Petrolia	36.8	.841
Ranger	37.0	.840
Santa Ana	39.4	.828
Strawn	35.6	.847
Average	36.1	.844
Panhandle	35.8	.846
Southwest—		
Bruni	18.0	.947
Hondo	19.0	.940
Mirando	23.0	.916
Randado	21.0	.928
Average	22.0	.922
West Texas—		
Big Lake	38.2	.834
Chalk	31.3	.869
Church-Fields	31.0	.871
Texas—Continued.		
Rest of State—Continued.		
West Texas—Continued.		
Hendricks	30.0	0.876
McCamey	28.0	.887
McElroy	32.0	.865
Westbrook	25.0	.904
World	29.7	.878
Yates	30.0	.876
Average	32.5	.863
Average for State	32.4	.863
West Virginia:		
Cabell	39.3	.829
Cabin Creek	47.0	.793
Kellys Creek	45.6	.799
"Pennsylvania"	42.7	.812
Average	43.3	.810
Wyoming:		
Big Muddy	32.4	.863
Dutton Creek	33.6	.857
Elk Basin	42.0	.816
Ferris	36.6	.842
Grass Creek	44.0	.806
Greybull	44.7	.803
Hamilton Dome	25.2	.903
La Barge	30.0	.876
Lance Creek	40.4	.823
Lander	23.4	.914
Lost Soldier	30.2	.875
Maverick	21.9	.922
Mule Creek	31.7	.867
Notches	22.0	.922
Oregon Basin	22.0	.922
Osage	37.6	.837
Pilot Butte	35.4	.848
Poison Spider	15.0	.966
Rex Lake	32.3	.864
Rock Creek	36.4	.843
Salt Creek	36.8	.841
Teapot	36.4	.843
Warm Springs	11.8	.987
Average	35.8	.846
Average for United States	32.2	.864

PRODUCTION OF PETROLEUM AND ROYALTIES FROM WELLS UNDER FEDERAL CONTROL

The following tables were compiled from data received by the United States Geological Survey and the Office of Indian Affairs.

The production of crude petroleum on Government lands showed a decline in 1927 as compared with 1926, and as a result of the drastic decline in crude prices the value of the royalty oil—that is, the receipts of the Government—was only 62 per cent of the 1926 total. Although the royalty from production on Indian lands showed a slight increase, the receipts from the sale of leases dropped to a comparatively small figure.

Crude petroleum produced on Government lands, 1926–27, under the operation of the leasing act of February 25, 1920

[From U. S. Geological Survey]

State and land office	1926			1927		
	Production (barrels)	Royalty		Production (barrels)	Royalty	
		Barrels	Value		Barrels	Value
California:						
Los Angeles	1, 765, 545. 69	253, 008. 85	$318, 661. 48	1, 728, 819. 07	237, 315. 51	$239, 749. 82
Sacramento, outside naval reserves				2, 697, 708. 95	345, 276. 01	267, 298. 86
Sacramento, inside naval reserves				5, 102, 307. 02	1, 172, 048. 30	983, 425. 31
Visalia, outside naval reserves	4, 810, 175. 23	681, 014. 33	639, 617. 50	2, 797, 458. 99	361, 142. 10	301, 650. 14
Visalia, inside naval reserves	12, 758, 234. 05	2, 908, 506. 89	3, 281, 758. 38	5, 792, 320. 12	1, 333, 662. 44	1, 356, 499. 35
	19, 333, 954. 97	3, 842. 530. 07	4, 240, 037. 36	18, 118, 614. 15	3, 449, 444. 36	3, 148, 623. 48
Colorado:						
Denver				404, 125. 48	32, 885. 98	22, 383. 70
Glenwood Springs	781, 276. 60	39, 651. 95	66, 012. 72	381, 598. 21	21, 962. 36	23, 379. 77
	781, 276. 60	39, 651. 95	66, 012. 72	785, 723. 69	54, 848. 34	45, 763. 47
Louisiana: Baton Rouge	3, 455. 08	431. 88	1, 001. 06	28, 972. 91	1, 021. 97	11, 346. 54
Montana:						
Billings	852, 794. 69	50, 269. 99	138, 073. 76	662, 344. 60	39, 818. 04	74, 679. 86
Great Falls	858, 025. 50	39, 081. 55	45, 058. 22	250, 511. 06	12, 574. 28	18, 132. 21
	1, 710, 820. 19	89, 351. 54	183, 131. 98	912, 855. 66	52, 392. 32	92, 812. 07
New Mexico:						
Las Cruces	24, 092. 98	3, 317. 07	5, 803. 43	53, 305. 26	8, 795. 23	9, 513. 80
Santa Fe	928. 54	185. 72	556. 31	110. 59	22. 12	66. 36
	25, 021. 52	3, 502. 79	6, 359. 74	53, 415. 85	8, 817. 35	9, 580. 16
Oklahoma: Guthrie	280, 501. 49	47, 905. 29	121, 992. 41	622, 767. 31	105, 670. 97	173, 847. 03
Wyoming:						
Buffalo	50, 690. 90	6, 269. 35	12, 832. 60	35, 115. 90	4, 020. 84	5, 744. 89
Cheyenne, outside naval reserves	16, 712, 168. 07	2, 654, 766. 52	5, 713, 495. 03	14, 610, 624. 41	2, 149, 200. 88	2, 980, 597. 94
Cheyenne, inside naval reserves	425, 684. 79	53, 210. 61	109, 783. 56	313, 892. 42	39, 236. 57	54, 517. 26
Evanston	77, 339. 13	4, 374. 76	4, 491. 14	338, 321. 64	22, 128. 55	10, 347. 13
Lander	436, 917. 17	57, 809. 18	78, 074. 07	254, 329. 35	32, 437. 33	32, 847. 44
	17, 702, 800. 06	2, 776, 430. 42	5, 918, 676. 40	15, 552, 283. 72	2, 247, 024. 17	3, 084, 054. 66
	39, 837, 829. 91	6, 799, 803. 94	10, 537, 211. 67	36, 074, 633. 29	5, 919, 219. 48	6, 566, 027. 41

Royalty receipts from production of oil and gas and bonuses paid for sale of leases on Indian reservations, fiscal years ended June 30, 1926 and 1927

[From Office of Indian Affairs]

Reservation	1926			1927		
	Oil and gas land leased during year (acres)	Receipts		Oil and gas land leased during year (acres)	Receipts	
		Bonus from sale of leases	Royalty from production		Bonus from sale of leases	Royalty from production
Five Civilized Tribes: Oil	96,572	$195,785	$3,454,563	78,286	$295,189	$3,522,896
Cheyenne and Arapaho: Oil	--------	--------	--------	477	477	--------
Kiowa:						
Oil	14,378	34,260	13,743	23,281	18,545	13,013
Gas	--------	--------	--------	--------	--------	4,084
Navajo (Pueblo Bonito): Oil	2,700	1,600	--------	2,720	11,200	--------
Navajo (San Juan): Oil	18,160	62,400	102,900	18,160	61,845	233,499
Osage:						
Oil	45,874	[1] 10,603,688	10,349,829	36,176	3,953	9,016,650
Gas						1,370,011
Pawnee:						
Oil	7,682	62,611	148,647	4,634	30,520	90,585
Gas	--------	--------	1,539	--------	--------	1,950
Ponca and Otoe:						
Oil	9,384	18,253	54,522	9,575	38,202	47,852
Gas	--------	--------	--------	--------	--------	4,626
Shawnee:						
Oil	4,666	48,526	138,846	18,424	222,307	39,465
Gas				--------	--------	3,186
Shoshone: Oil	3,323	1,942	7,334	1,832	2,350	13,062
Ute: Oil	9,300	2,400	--------	160	336	--------
	212,039	11,031,465	14,271,923	193,725	684,924	14,360,879

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[1] Including deferred payments.

SUMMARY OF REFINERY STATISTICS

Refinery statistics, combined with statistics of crude petroleum and natural gasoline, are issued monthly by the Bureau of Mines. No attempt is made here to present other than an abbreviated summary of the major refined products for the 5-year period 1923–1927. Detailed statistics of refined products for 1927 are contained in Bureau of Mines' Bulletin 297, Petroleum Refinery Statistics, 1927.

Another material increase in annual throughput at refineries in the United States was recorded in 1927, when a total of 828,835,000 barrels of crude petroleum was run to stills. Of this amount, 778,729,000 barrels was domestic crude petroleum and 50,106,000 barrels foreign crude petroleum, or increases of 6 and 11 per cent, respectively, over the 1926 totals.

The production of motor fuel in the United States in 1927 amounted to 14,030,058,000 gallons, or 334,049,000 barrels. Of this amount, 824,000 barrels was natural gasoline blended at the plants, 228,000 barrels was natural gasoline sold direct to jobbers, and 2,562,000 barrels was benzol obtained from by-product coke and blended with motor fuel Deducting these items, which amount to slightly more than 1 per cent of the total, leaves 330,435,000 barrels of "gasoline" as manufactured at refineries. The percentage yield of gasoline from crude run to stills continued to rise and for 1927 amounted to 39.9 per cent, as compared with 38.5 per cent in 1926.

Gasoline consumption continued to increase in 1927. The daily average indicated domestic demand amounted to 816,000 barrels, as compared with a daily average of 717,000 barrels in 1926, or an increase of 14 per cent.

The record of gasoline stocks in 1927 supplied one of the most interesting phases of the industry. Total stocks on hand during the first six months of the year were considerably in excess of those held for the same months of 1926, whereas in general the reverse was true for the last half of the year. Stocks on hand at the end of 1927 amounted to 32,338,000 barrels, as compared with 39,023,000 barrels for the previous year.

A further decline in the percentage yield of kerosene was recorded in 1927, when the total production was equivalent to only 6.8 per cent of the crude run to stills, as compared with 7.9 per cent in 1926. The total output in 1927 was 56,113,000 barrels, as compared with 61,768,000 barrels in 1926, a decrease of 9 per cent. The total indicated domestic demand for kerosene in 1927 amounted to 37,491,000 barrels, a slight drop from the previous year. As with gasoline, kerosene stocks were reduced materially during the year, declining from 8,575,000 barrels on hand December 31, 1926, to 7,715,000 barrels at the end of 1927.

In 1927 the recovery of gas oil and fuel oil, the most important class of commodities in point of volume, was 47.4 per cent of the total crude runs, as compared with 46.9 per cent in 1926. This was the first year since 1924 that the percentage recovery of gas oil and fuel oil showed an increase, which undoubtedly resulted from the slowing down in cracking activity. The total production of gas oil and fuel oil in 1927 amounted to 393,066,000 barrels, as compared with 365,195,000 barrels in 1926, an increase of 7.6 per cent. Stocks of gas oil and fuel oil held east of California were generally higher than in 1926 and on December 31, 1927, amounted to 34,022,000 barrels, as compared with 24,898,000 barrels at the end of the previous year.

The trend in the statistics of lubricants was reversed in 1927, when this product, like kerosene, decreased in both output and indicated domestic demand. The percentage yield fell from 4.1 per cent for 1926 to a new low of 3.8 per cent for 1927. Exports of lubricants were higher, but stocks increased during the year.

The total output of wax dropped from the record figure of 1926 to slightly below the production of 1925. Exports of wax were only slightly higher than in 1926, but imports more than doubled. The situation as to stocks of wax in 1927 was virtually the reverse of 1926, with total withdrawals of 18,117,000 pounds, as compared with additions to stocks for 1926 of 68,940,000 pounds.

The production and consumption of both coke and asphalt in 1927 showed substantial increases over 1926.

Losses, or shortage, at refineries in 1927 amounted to 28,396,000 barrels, equivalent to 3.4 per cent of the total crude petroleum run to stills. This represents a drop from the 3.5 per cent recorded in 1926, which was probably due to less cracking.

Refinery statistics, 1923–1927

[Thousands of barrels of 42 U. S. gallons except as otherwise indicated]

	1923	1924	1925	1926	1927
Crude oil run to stills:					
Domestic	538, 252	597, 954	698, 582	734, 301	778, 729
Foreign	42, 986	45, 765	41, 338	44, 963	50, 106
	581, 238	643, 719	739, 920	779, 264	828, 835
Natural gasoline run to stills or blended at refineries	5, 487	12, 671	[1] 19, 636	[1] 27, 696	[1] 32, 162
Stocks of crude oil (domestic and foreign) at refineries at end of year	33, 259	40, 995	[2] 27, 157 [3] 29, 200	[2] 35, 475	[2] 39, 317
Gasoline:					
Produced	179, 903	213, 326	259, 601	299, 734	330, 435
Imported	4, 555	3, 453	3, 813	5, 540	5, 002
Exported [4]	20, 741	28, 967	31, 497	43, 313	44, 337
Consumed	156, 746	185, 003	223, 865	261, 813	296, 807
Stocks at refineries at end of year	28, 014	30, 823	38, 875	39, 023	33, 316
Kerosene:					
Produced	55, 927	60, 026	59, 689	61, 768	56, 113
Imported	7	10	19	74	55
Exported [4]	20, 347	21, 961	21, 212	22, 248	19, 537
Consumed	35, 048	36, 712	39, 969	38, 140	37, 491
Stocks at refineries at end of year	7, 231	8, 594	7, 121	8, 575	7, 715
Gas oil and fuel oil:					
Produced	287, 481	320, 476	364, 991	365, 195	393, 066
Imported	12, 286	12, 927	12, 245	14, 432	8, 124
Exported [4]	33, 372	37, 249	36, 088	38, 351	47, 391
Consumed	261, 388	292, 452	(5)	(5)	(5)
Stocks at refineries at end of year	36, 072	[2] 19, 556	[2] 24, 681	[2] 24, 898	[2] 34, 022
Lubricants:					
Produced	26, 128	27, 498	31, 055	32, 293	31, 721
Imported	29	11	37	33	8
Exported [4]	8, 372	9, 103	9, 678	9, 435	9, 776
Consumed	17, 260	18, 124	20, 581	22, 568	21, 669
Stocks at refineries at end of year	6, 138	6, 420	7, 253	7, 576	7, 860
Wax (thousands of pounds):					
Produced	466, 647	516, 491	590, 577	645, 815	584, 347
Stocks at refineries at end of year	164, 758	89, 706	116, 391	185, 331	167, 214
Coke (thousands of short tons):					
Produced	672. 5	761. 1	991. 0	995. 3	1, 145. 2
Stocks at refineries at end of year	26. 3	97. 8	238. 4	290. 6	345. 1
Asphalt (thousands of short tons):					
Produced	2, 327. 1	2, 545. 6	2, 677. 4	2, 922. 8	3, 417. 7
Stocks at refineries at end of year	118. 1	97. 3	159. 4	193. 3	220. 8
Losses [6]	18, 921	19, 590	22, 914	26, 928	28, 396

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[1] Includes natural gasoline run through pipe lines in California.
[2] East of California.
[3] Includes 2,043,000 barrels in coastwise transit.
[4] Including shipments to Alaska, Hawaii, and Porto Rico.
[5] Figures not available.
[6] Difference between total runs to stills and the volume of the classified products reported.

OIL SHALE AND SHALE OIL

The oil-shale industry in the United States was adversely affected by the low price of crude petroleum in 1927; most of the operations of the year were experimental. Production of shale oil was reported by four plants—The Washington Shale Oil & Products Co., of De Beque, Colo.; The Wyoming Oil Products Co., of Green River, Wyo.; the N. T. U. Co., of Santa Maria, Calif.; and the Bureau of Mines experimental plant at Rulison, Colo. These four plants treated a total of about 8,400 short tons of shale, from which about 270,000 gallons of shale oil was extracted.

As noted in "Petroleum in 1926," the Scottish or Pumpherston retort was operated during the closing months of 1926, but up to January 1, 1927, no runs had been made in the N. T. U. or American type retort. The record of events in 1927 has been published by the bureau and by M. J. Gavin [2] in part, as follows:

> The work of setting up the N. T. U. retort at the plant site was completed in December, 1926. The first run in this type of retort was made on January 17, 1927, and it was operated intermittently until June 1, 1927.
>
> In all, 29 runs were made with the N. T. U. retort. The total amount of shale retorted was 788.4 tons, and the total oil recovered was 13,774 gallons—an average yield of 17.47 gallons of oil per ton. The assay values of the shales retorted ranged from 11 to 38.4 gallons per ton, and oil recoveries ranged from 36 to 94 per cent of the assay values of the shales. These yields and recoveries do not include light naphtha and oil recoverable from the retort gases.
>
> The N. T. U. retort successfully handled all grades of shales except those of the coking variety. The coking shales shortly after the start of a run formed enough coke practically to stop gas circulation. Future study may determine operating methods which will permit coking mixtures to be handled.
>
> The operation of the retort is quite simple; usually after conditions have been established at the beginning of the run it requires little attention, except an occasional adjustment of the valves, until the charge is ready to dump. The oil fog in the waste gas was a serious nuisance until means were provided for its proper disposition.
>
> It was sometimes difficult to determine just when the charge was completely retorted. This fact accounts, first, for some of the low oil recoveries when the charge was dumped before all the oil had been distilled, and, second, for some of the long retorting times when the charge was evidently dumped some time after all the oil had been produced. This problem will probably be solved when the operators become more familiar with the behavior of the retort.
>
> The oils produced by the N. T. U. retort are uniformly heavier and contain a smaller amount of the more volatile fractions than those produced by the Pumpherston retort but otherwise are quite similar. Evidently there is less secondary decomposition in the N. T. U. retort.
>
> The Pumpherston retort operated continuously after January 1 without giving the slightest trouble until March 17, when the shale hung up in the retort; this marked the beginning of trouble caused by coking shale which continued periodically until June 15. From June 15 until July 1 operation was smooth, and splendid results were obtained.
>
> The only trouble experienced with the Pumpherston retort was that caused by coking shale; whether the difficulty was due primarily to the type of shale used or to leakage of air and hot combustion products into the retort through a crack in the inner wall has not yet been determined.

From January 1 to June 30 about 1,100 tons of shale was put through the Pumpherston retort, and the crude shale oil produced was about 20,000 gallons—an average yield of 18.2 gallons per ton.

Scotland and Estonia easily outranked all other nations, including the United States, in the production of shale in 1927. The output of Scotland in 1927 registered a small increase over 1926, but that of Estonia fell off.

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[2] Gavin, M. J., Experimental Oil-Shale Plant of the Bureau of Mines: Ind. and Eng. Chem., vol. 20, No. 8, August, 1928, p. 784.

World production of oil shale, 1923–1927, in metric tons

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
Australia:					
New South Wales	1,226	652			
Tasmania	1,119	1,601	833	2,161	3,201
Estonia	214,099	233,631	288,104	431,678	397,609
France [1]	62,142	70,968	67,127	(2)	(2)
Germany (Bavaria)	1,202	530	400	10	480
Great Britain:					
England	71				
Scotland	2,906,475	2,902,960	2,504,390	1,991,250	2,080,122
India, British			41		
Italy	5,662	2,987	2,700	10,200	12,090
Russia [3]	29,779	11,684	1,130	4,095	(2)
Spain	(4)	(4)	(4)	(4)	(4)
Sweden	(5)	(5)	(5)	(5)	(5)
United States	[6] 9,300	[6] 21,200	(7)	5,500	7,600

[1] Includes some boghead coal.
[2] Data not available.
[3] Data for year ended Sept. 30.
[4] There is in operation in Puertollano a plant for the treatment of oil shale and impure coal to obtain oil but no details of production are available.
[5] Data on production of oil shale not available; the following quantities of shale oil were extracted from alum shale: 1923, 158 tons; 1924, none; 1925, 12 tons; 1926, 51 tons; 1927, 22 tons.
[6] Estimated. Used in production of shale oil.
[7] Produced by one company; figures confidential and can not be disclosed.

PROPERTIES OF CRUDE OILS FROM VARIOUS FIELDS OF THE UNITED STATES

The following table is a continuation of the publication of a summary of analyses of typical crude oils begun in Petroleum in 1925:

Properties of typical crude oils from fields of the United States

Sample No.	State	County	Field or district	Producing formation	Depth (feet)	Properties of crude					Gasoline fraction		Kerosene fraction		Viscosity at 100° F. of vacuum fractions			Carbon residue, per cent
						Specific gravity	Degrees A. P. I.	Sulphur content	Viscosity at 100° F.	Pour test ° F.	Per cent	Degrees A. P. I.	Per cent	Degrees A. P. I.	225–250° C.	250–275° C.	275–300° C.	
27860	Texas	Crane-Upton	Church-Fields	Permian lime	2,900–3,200	0.870	31.1	2.69	50	(1)	26.8	57.4	9.8	41.5	62	100	180	12.0
27861	do	do	McElroy	do	2,800–2,900	.860	33.0	2.42	51	(1)	27.0	57.9	9.5	41.3	61	93	175	11.3
27867	do	Crockett	World	do	2,500–2,700	.878	29.7	.59	80	35	18.8	54.7	4.0	40.9	69	110	200	5.8
27858	do	Howard	Chalk	Chalk	1,600–1,630	.869	31.3	.91	63	35	23.7	56.2	10.0	41.7	61	91	145	12.5
27857	do	do	do	Permian lime	2,956–2,990	.894	26.8	2.02	66	25	21.2	54.9	4.5	41.1	63	97	180	13.9
27866	do	Reagan	Big Lake	do	2,900–3,100	.834	38.2	.36	41	(1)	32.8	59.5	9.8	41.3	66	105	200	4.6
27863	do	Upton	McCamey	do	1,800–2,300	.907	24.5	2.29	110	(1)	14.5	50.9	5.0	40.6	70	125	230	11.7
27859	do	Winkler	Hendricks	do	2,700–3,100	.876	30.0	1.53	56	(1)	22.7	57.7	5.6	41.1	76	135	270	8.5

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[1] Below 5° F.

COKE AND BY-PRODUCTS

By F. G. Tryon and H. L. Bennit

ACKNOWLEDGMENTS

This report is made possible by voluntary cooperation of the producers of coke, who have courteously supplied the statistical information on which it is based. Special acknowledgment is made of the assistance rendered by operators of by-product ovens in supplying monthly reports of coke output and by the railroads in reporting weekly the number of cars of beehive coke loaded for shipment. The United States Engineer office has supplied monthly reports of shipments on the Monongahela River and other waterways. Cordial thanks are extended to these and all others who have furnished information.

REVIEW OF THE INDUSTRY IN 1927

For the coke industry 1927 was an uneventful year, marked by a recession in demand but by continued activity in the construction of new by-product ovens. The total production was 51,092,000 tons, a decrease of 5,774,000 tons, or 10 per cent, in comparison with 1926. The burden of the decrease was borne almost entirely by producers of beehive coke, the output of which fell from 12,489,000 tons in 1926 to 7,207,000 in 1927, a decrease of 42 per cent. The output of by-product coke also declined, but the change was slight; the 43,885,000 tons produced during the year came within 1.1 per cent of the record established in 1926 and in comparison with any earlier year showed a large increase. The number of new by-product ovens completed during the year was 990.

The checking of demand was primarily due to a recession in general business. According to the Federal Reserve Board the volume of manufacturing production in the country declined 3 per cent from 1926 to 1927, a decline reflected in lessened consumption of metallurgical coke. The production of pig iron fell off 7 per cent, and the consumption of coke by blast furnaces declined from 39,709,000 tons in 1926 to 37,373,000 tons in 1927. (Table 46.) A similar decrease marked the sales of foundry coke, which fell from 3,332,000 tons in 1926 to 2,748,000 in 1927.

The demand for household ("domestic") heating was naturally less in 1927 than in the year before, when the great anthracite strike had created a shortage of house fuel. The total sales for domestic use in 1927 were 4,814,000 tons, as against 5,443,000 in 1926. In comparison with 1924, the last preceding year unaffected by a shortage of anthracite, the sales in 1927 showed an increase of 1,861,000 tons. It is therefore clear that the domestic coke market is expanding rapidly. A special discussion of domestic by-product coke is given on pages 638 to 646 of this report.

The decreased demand in 1927, especially for metallurgical coke, is reflected in the trend of monthly production and of prices. After a temporary upward trend in the first quarter production of both pig iron and coke decreased steadily to the end of the year. (Fig. 18.) The spot price of beehive furnace coke f. o. b. ovens, Connellsville, fell from $3.50 in January to $2.75 in December (fig. 20), and the average for the year as a whole was $3.04, against $3.92 in 1926.

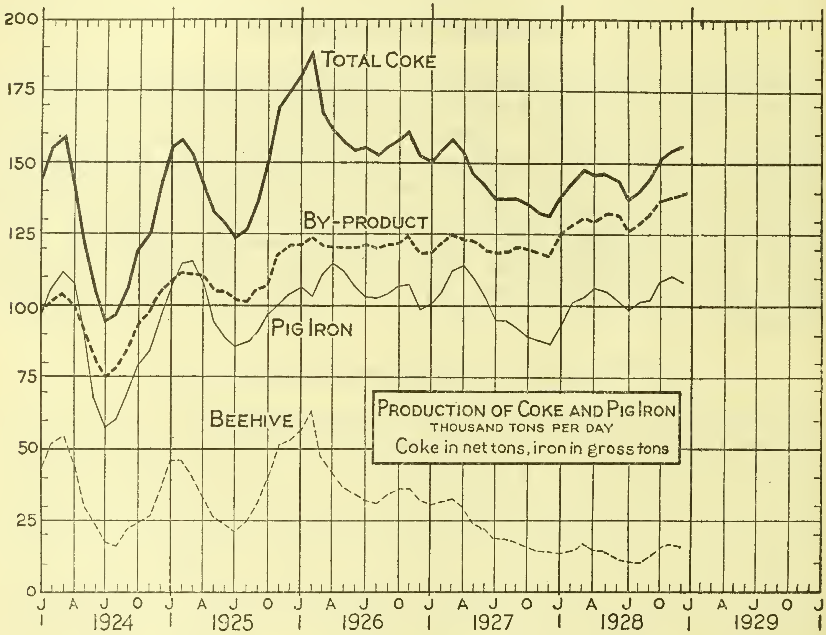

FIGURE 18.—Average daily production of beehive and by-product coke and of pig iron, by months, 1924–1928

Spot prices of by-product coke also declined. (Fig. 26.) The average realization on sales of by-product coke for domestic and miscellaneous use decreased from $7.42 in 1926 to $6.88. (Fig. 23.) Coincident with the decline in prices, stocks of unsold coke at the works increased. (Fig. 19.)

In spite of the recession of demand three new by-product plants were completed in 1927, and batteries of new ovens were fired at other plants. The number of beehive ovens continued to decrease. For the year as a whole the beehive plants furnished 14.1 per cent of the supply and for the month of December only 9.6 per cent.

No great change occurred in 1927 in the proportion of by-product coke furnished by "furnace" and "nonfurnace" plants. Of the total 77.7 per cent was made in "furnace" ovens and 22.3 per cent in merchant or other plants. In 1913 the corresponding percentages were 73.0 and 27.0 (Table 9).

Spot prices of coking coals f. o. b. mines were lower in 1927 than in 1926, but as coke operators purchase chiefly on contract and often have their own mines the effect on the average cost of coal charged was small. The average cost per ton delivered at by-product ovens, which has been gradually falling since 1923, was $3.88 in 1926 and $3.87 in 1927. (Fig. 25.) Low prices at the mines continued to favor the coking coals of the Appalachians in competition with the high-oxygen coking coals of the Middle West, and of the total of 64,460,000 tons purchased for by-product use in 1927 only 437,000 tons came from Illinois, 172,000 from western Kentucky, and 7,800 from Indiana. (Table 31.)

The market for the by-products in 1927 showed a continuation of the tendencies manifest in recent years. The yield of by-products per ton of coal carbonized continued to increase slowly. Prices of the light-oil group have shown no great change. Receipts per gallon of tar continued to increase in 1927 and receipts per pound of ammonium sulphate to decline. Increased credits for gas reflect both a larger percentage of surplus available for use or sale and higher prices for gas sold for city distribution; and because of these changes gas is now the most important by-product. In 1927 the gross return from surplus gas per ton of coke produced was $1.60 and the total for all by-products combined $3.66 (fig. 27). Coke-oven gas now supplies 59 per cent of the total sales of manufactured gas in the United States.

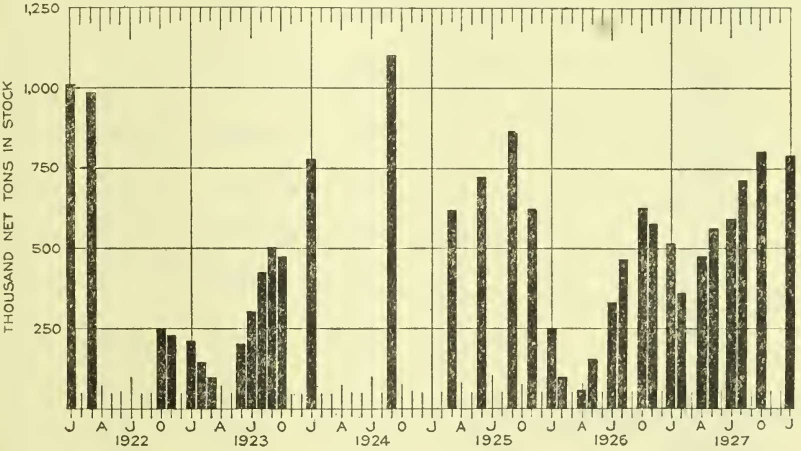

FIGURE 19.—Stocks of unsold coke on hand at a group of 21 by-product plants making coke suitable for domestic use and supplying gas for city distribution, 1922–1927

STATISTICAL SUMMARY

The principal statistical facts of the coke industry in 1927 are presented in Tables 1 and 2.

TABLE 1.—*Salient statistics of the coke industry in 1927*

	By-product	Beehive	Total
Coke produced:			
Quantity net tons	43, 884, 726	7, 207, 417	51, 092, 143
Value	$232, 043, 803	$30, 276, 775	$262, 320, 578
Screenings and breeze produced:			
Quantity net tons	4, 099, 702	146, 362	4, 246, 064
Value	$8, 673, 616	$199, 263	$8, 872, 879
Coal charged into ovens:			
Quantity net tons	63, 239, 773	11, 208, 115	74, 447, 888
Value	$244, 674, 126	$23, 261, 627	$267, 935, 753
Average value	$3. 87	$2. 08	$3. 60
Average yield in per cent of coal charged:			
Coke	69. 4	64. 3	68. 6
Breeze (at plants actually recovering)	6. 5	3. 1	6. 2
Ovens:			
In existence Jan. 1	11, 716	52, 558	64, 274
In existence Dec. 31	12, 475	49, 795	62, 270
Dismantled during year	291	2, 876	3, 167
In course of construction Dec. 31	289	------------	289
Daily coke capacity of ovens in existence Dec. 31 net tons	158, 499	(1)	(1)
Coke used by operator in blast furnace or affiliated works:			
Quantity net tons	30, 687, 198	905, 359	31, 592, 557
Value	$145, 123, 216	$4, 035, 732	$149, 158, 948
Disposal of coke:			
Sold for furnace use to affiliated corporations—			
Quantity net tons	2, 959, 247	2, 017, 616	4, 976, 863
Value	$15, 903, 197	$9, 153, 274	$25, 056, 471
Merchant sales of furnace coke—			
Quantity net tons	967, 277	2, 780, 433	3, 747, 710
Value	$5, 393, 276	$10, 243, 163	$15, 636, 439
Sold for foundry use—			
Quantity net tons	1, 938, 653	809, 590	2, 748, 243
Value	$15, 112, 967	$4, 085, 876	$19, 198, 843
Sold for domestic use—			
Quantity net tons	4, 702, 529	111, 103	4, 813, 632
Value	$32, 447, 939	$446, 236	$32, 894, 175
Sold for other industrial use—			
Quantity net tons	2, 022, 838	569, 749	2, 592, 587
Value	$13, 812, 393	$2, 154, 443	$15, 966, 836
Disposal of screenings and breeze:			
Used by operator—			
Quantity net tons	3, 439, 571	47, 406	3, 486, 977
Value	$6, 769, 151	$24, 052	$6, 793, 203
Sold—			
Quantity net tons	716, 237	38, 277	754, 514
Value	$2, 042, 496	$82, 359	$2, 124, 855
Average receipts per ton sold:			
Furnace coke (merchant sales)	$5. 58	$3. 68	$4. 17
Foundry coke	$7. 80	$5. 05	$6. 99
Domestic coke	$6. 90	$4. 02	$6. 83
Other industrial coke	$6. 83	$3. 78	$6. 16
Screenings and breeze	$2. 85	$2. 15	$2. 82
By-products produced:			
Gas M cubic feet	700, 894, 799	------------	700, 894, 79
Wasted per cent	1. 7	------------	1. 7
Burned in coking process do	40. 1	------------	40. 1
Surplus sold or used do	58. 2	------------	58. 2
Tar gallons	546, 859, 205	------------	546, 859, 205
Ammonium sulphate or equivalent pounds	1, 434, 920, 352	------------	1, 434, 920, 352
Crude light oil gallons	164, 488, 233	------------	164, 488, 233
Yield of by-products per ton of coal:			
Gas M cubic feet	11. 1	------------	11. 1
Tar gallons	8. 6	------------	8. 6
Ammonium sulphate or equivalent pounds	22. 7	------------	22. 7
Crude light oil gallons	2. 9	------------	2. 9
Value of by-products sold:			
Gas (surplus)	$70, 092, 168	------------	$70, 092, 168
Tar—			
Sold	$16, 095, 478	------------	$16, 095, 478
Used by producer	$12, 770, 935	------------	$12, 770, 935
Ammonium sulphate or equivalent	$27, 383, 268	------------	$27, 383, 268
Crude light oil and derivatives	$25, 153, 099	------------	$25, 153, 099
Other by-products [2]	$179, 869	------------	$179, 869
Total value of coke, breeze, and by-products [3]	$392, 392, 236	$30, 476, 038	$422, 868, 274

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[1] Data not available.

[2] Includes naphthalene.

[3] Includes value of tar used by the coke plants. Corresponding value for earlier years has not been included in preceding issues of this table.

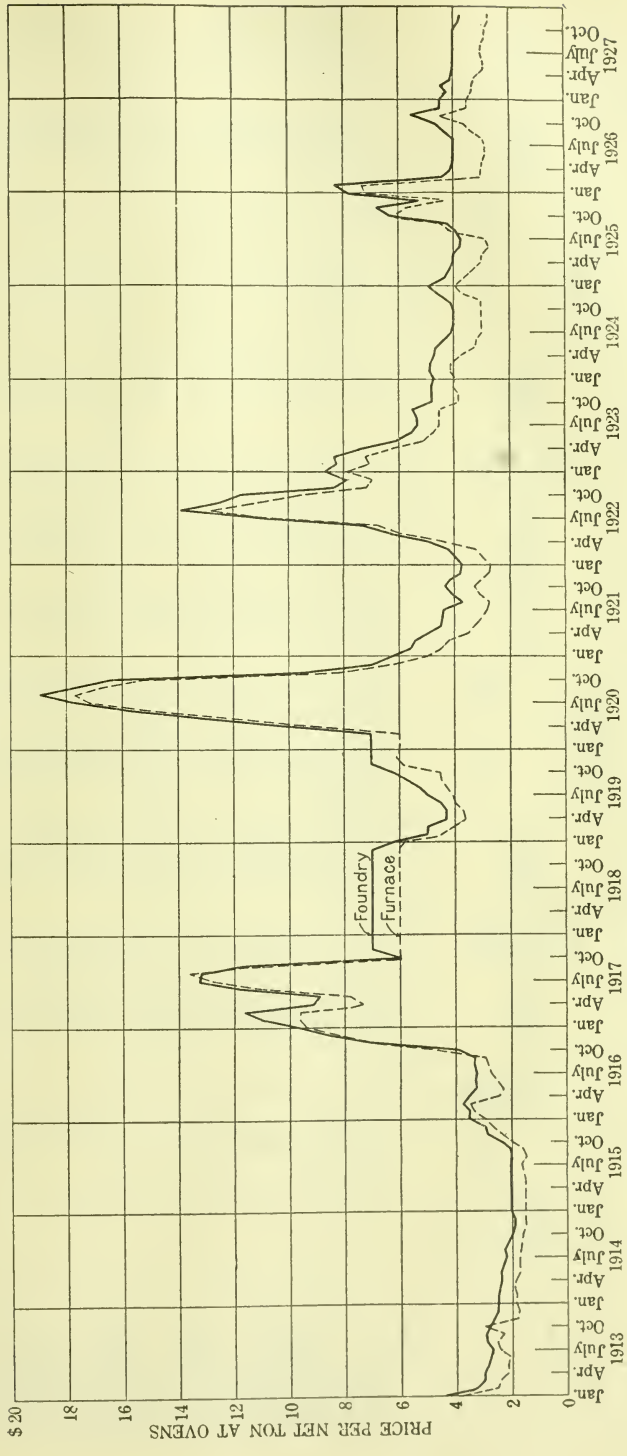

FIGURE 20.—Average monthly prices of spot or prompt Connellsville coke at ovens, 1913–1927, as quoted by Iron Age

TABLE 2.—*Summary of coke produced, value, number of ovens, coal charged, and average yield, by States, 1926–27*

[Exclusive of screenings and breeze]

State	By-product								Beehive						Total	
	Plants in existence	Ovens		Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens		Ovens	Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens		Coke produced (net tons)	Value of coke at ovens
		Built	Under construction Dec. 31				Total	Per ton					Total	Per ton		
1926																
Alabama	8	1,276	112	6,799,773	70.3	4,779,986	$16,823,492	$3.52	1,831	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Colorado	1	120		859,725	69.0	592,939	(2)	(2)	1,527	307,011	64.2	197,179	(2)	(2)	790,118	(2)
Georgia									151	5,125	59.7	3,059	$23,034	$7.53	3,059	$23,034
Illinois	7	849		4,712,342	70.8	3,336,962	25,050,474	7.51							3,336,962	25,050,474
Indiana	7	1,394	40	7,994,696	74.9	5,990,344	44,143,059	7.37							5,990,344	44,143,059
Kentucky	1	(1)		(1)	(1)	(1)	(1)	(1)	763	249,952	59.0	147,540	600,169	4.07	(1)	(1)
Maryland	1	300	60	1,534,021	73.1	1,120,610	(2)	(2)							1,120,610	(2)
Massachusetts	2	466	15	874,053	65.6	573,748	(2)	(2)							573,748	(2)
Michigan	5	420	120	2,522,841	72.4	1,826,638	12,713,083	6.96							1,826,638	12,713,083
Minnesota	3	220		903,041	68.6	619,905	6,014,738	9.70							619,905	6,014,738
Missouri	1	(1)		(1)	(1)	(1)	(1)	(1)							(1)	(1)
New Jersey	2	207		1,260,372	72.5	913,250	(2)	(2)							913,250	(2)
New Mexico									584	(1)	(1)	(1)	(1)	(1)	(1)	(1)
New York	8	661	117	3,950,026	71.6	2,827,805	17,455,226	6.17							2,827,805	17,455,226
Ohio	14	1,689	89	10,962,723	68.9	7,547,836	40,344,524	5.35	204	125,883	67.5	84,970	(2)	(2)	7,632,806	(2)
Oklahoma									300							
Pennsylvania	12	3,126	425	16,895,070	66.3	11,200,624	48,722,935	4.35	34,375	16,344,439	65.6	10,722,352	47,595,184	4.44	21,922,976	96,318,119
Rhode Island	1	(1)		(1)	(1)	(1)	(1)	(1)							(1)	(1)
Tennessee	1	24		165,065	71.9	118,624	628,482	5.30	1,605	215,647	56.8	122,410	605,017	4.94	241,034	1,233,499
Utah	1	33		326,544	56.6	184,756	(2)	(2)	819	203,750	59.6	121,475	1,033,284	8.51	306,231	(2)
Virginia									2,914	599,943	61.8	370,983	1,716,716	4.63	370,983	1,716,716
Washington	1	20		67.544	63.0	42,584	303,624	7.13	332	39,265	62.9	24,702	214,429	8.68	67,286	518,053
West Virginia	4	411		1.632,790	69.2	1,129,862	4,265,884	3.78	7,153	957,029	61.0	583,599	2,652,219	4.54	1,713,461	6,918,103
Wisconsin	2	(1)		(1)	(1)	(1)	(1)	(1)							(1)	(1)
Combined States		500		2,185,984	71.8	1,570,113	11,621,482	7.40		176,456	62.7	110,682	730,590	6.60	6,608,321	29,775,733
Undistributed							22,661,530	6.69					1,854,227	6.57		65,893,565
	82	11,716	978	63,646,610	69.7	44,376,586	250,748,533	5.65	52,558	19,224,500	65.0	12,488,951	57,024,869	4.57	56,865,537	307,773,402

1927																
Alabama	8	1,325	63	6,203,290	70.4	4,364,354	13,500,234	3.09	1,831						4,364,354	13,500,234
Colorado	1	120		867,792	68.5	594,402	(2)	(2)	1,498	299,559	64.8	194,184	(2)	(2)	788,586	(2)
Connecticut			61													
Georgia									151	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Illinois	7	849	101	4,367,337	69.0	3,013,940	21,076,519	6.99							3,013,940	21,076,519
Indiana	7	1,384		7,448,393	74.5	5,549,762	37,152,981	6.69							5,549,762	37,152,981
Kentucky	(1)	(1)		(1)	(1)	(1)	(1)	(1)	763	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Maryland	1	360		1,476,742	73.0	1,077,309	(2)	(2)							1,077,309	(2)
Massachusetts	3	481		1,092,900	68.1	744,091	6,008,556	8.08							744,091	6,008,556
Michigan	6	561		2,693,576	71.3	1,920,394	12,227,241	6.37							1,920,394	12,227,241
Minnesota	3	215	41	919,801	68.8	632,628	6,212,501	9.82							632,628	6,212,501
Missouri	(1)	(1)		(1)	(1)	(1)	(1)	(1)							(1)	(1)
New Jersey	2	207		1,244,627	72.8	906,321	(2)	(2)							906,321	(2)
New Mexico									584							
New York	8	778		5,114,280	70.4	3,602,642	24,125,451	6.70							3,602,642	24,125,451
Ohio	15	1,778		10,470,533	68.9	7,213,619	34,684,465	4.81	204	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Oklahoma									100							
Pennsylvania	12	3,429		16,690,980	66.3	11,061,084	44,601,757	4.03	32,135	8,729,862	65.5	5,716,207	22,568,318	3.95	16,777,291	67,170,075
Rhode Island	(1)	(1)		(1)	(1)	(1)	(1)	(1)							(1)	(1)
Tennessee	1	24		162,372	75.3	122,312	612,783	5.01	1,465	185,829	56.4	104,808	536,821	5.12	227,120	1,149,604
Utah	1	33	23	318,367	61.9	197,183	(2)	(2)	819	142,053	59.7	84,865	(2)	(2)	282,048	(2)
Virginia									3,014	528,032	60.0	316,754	1,413,595	4.46	316,754	1,413,595
Washington	1	20		64,926	62.5	40,570	283,990	7.00	332	47,953	64.0	30,701	246,769	8.04	71,271	530,759
West Virginia	4	411		2,065,812	67.6	1,396,285	4,679,048	3.35	6,899	898,043	58.7	527,142	2,161,310	4.10	1,923,427	6,840,358
Wisconsin	(1)	(1)		(1)	(1)	(1)	(1)	(1)							(1)	(1)
Combined States	5	500		2,038,045	71.0	1,447,830	10,624,596	7.34		376,784	61.8	232,756	1,317,756	5.66	8,894,205	46,626,817
Undistributed							16,253,681						2,032,206			18,285,887
	85	12,475	289	63,239,773	69.4	43,884,726	232,043,803	5.29	49,795	11,208,115	64.3	7,207,417	30,276,775	4.20	51,092,143	262,320,578

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[1] Included under "Combined States."

[2] Included under "Undistributed."

SCOPE OF REPORT

DEFINITIONS OF TERMS USED IN STATISTICAL TABLES

The standard unit of measurement in the coke industry in the United States is the short or net ton of 2,000 pounds; unless other notation is made it is the unit employed throughout this chapter.

The term "coke" does not include breeze or fine coke screenings, because operators in general, especially those in the beehive industry, do not regard this fine material as properly so classified. No effort has been made to define accurately the limitation as to size between coke and breeze. Each operator has followed his own regular practice in reporting his output of fine material to the Bureau of Mines. It is probably safe to say, however, that coke breeze and screenings correspond closely in size to the anthracite usually classified as steam sizes; in other words, they include material smaller than pea coal.

For reasons explained in a later section the statistics of by-product coke in this chapter cover the operations of all by-product coke ovens, including those installed and operated by public utilities engaged primarily in manufacturing gas for city supply.

ACCOUNTING PRACTICES OF COKE OPERATORS THAT AFFECT STATISTICS

The term "value" as applied to coke in this report means the value at the ovens. For the part of the output that is sold the value is obviously the amount received for the coke f. o. b. ovens, but a considerable proportion of the coke produced in the United States is made in ovens operated by large corporations that not only mine the coal and make the coke but also have blast furnaces and steel mills that consume the entire product of the ovens. Under such conditions fixing a value upon the coke and upon the coal consumed in making it is purely arbitrary. Some corporations charge the coke to the furnace department at cost; others add a percentage of profit or base the reported value on what the coke would cost if purchased.

These differences in accounting practice also affect the relative proportions of the output reported as "sold" and as "used by producer." Between the blast furnaces, which are the largest users of coke, and the coke plants there is a close business relation that at many plants amounts to identity of ownership. Among such affiliated interests the line between sales and interdepartmental transfers is difficult to draw, and a large part of the furnace coke reported as sold actually goes to iron furnaces that are in some way connected with the coke companies. (See Tables 35 and 36.)

COKE-PRODUCING INDUSTRIES

In the United States coke is produced by a group of five different industries. In addition to that produced in the familiar beehive and by-product ovens, coke is obtained in the refining of petroleum, in the manufacture of coal gas, and in the refining of coal tar. The coke produced, however, differs greatly in character, and the problems affecting each of these industries are separate and distinct.

PETROLEUM COKE

When the refining of crude oil is conducted at temperatures above that of decomposition an ultimate residue is left known as petroleum coke. Its physical properties are much like those of coke made from coal, except that it is finer in texture, lacks the strength required for metallurgical coke, and is extraordinarily low in ash, probably averaging not more than 1.5 per cent. In 1927 the total production of petroleum coke amounted to 1,145,200 tons. Because of its extremely low ash content petroleum coke is in demand as a source of comparatively pure carbon and is widely used in the manufacture of carbon electrodes, electric-furnace resisters, and dry cells. The rest of the output is disposed of locally, either for domestic fuel or for miscellaneous industrial purposes. According to figures collected by the Bureau of Mines, the production of petroleum coke in recent years has been as follows:

Petroleum coke produced and in stock in the United States, 1918–1927, in net tons

Year	Production	Stock at end of year	Year	Production	Stock at end of year
1918	559,663	22,605	1923	672,526	26,264
1919	603,459	21,146	1924	761,095	97,844
1920	576,613	31,469	1925	990,991	238,403
1921	604,465	74,508	1926	995,308	290,582
1922	707,064	35,722	1927	1,145,200	345,100

GAS-HOUSE COKE

In the manufacture of coal gas, as in petroleum refining, the coke obtained is a by-product. The process of carbonization is essentially the same as that in by-product ovens, although the type of oven is different. The coals used are selected for the quality and volume of the gas evolved rather than for their coking properties, and the coke formed is too soft and friable, too high in volatile matter, and too irregular in quality for foundry or furnace use. It is, however, suitable for the manufacture of water gas, a fact that has led many gas companies to combine water gas and coal gas in the same plant. In recent years about one half the gas-house coke produced has been used for making water gas, for heating retorts, or for boiler fuel about the plant where it was produced, the other half being sold largely for domestic fuel. Even for househeating, however, it commands a lower price than by-product coke especially prepared for domestic use.

COAL-TAR COKE

Recent developments have made available another form of coke—that derived from coal-tar pitch. The product, which is known as pitch coke, is not to be confused with the tar-still coke, sometimes obtained as the end product of the distillation of tar. Tar-still coke is too soft for metallurgical use and is of relatively small value; for this and other reasons it is common practice to run the pitch out of the stills before it reaches the stage of coking. By introducing the pitch into a coke oven, however, and by coking it an excellent metallurgical coke may be produced, unusually hard and firm, containing only 0.3 per cent of ash, and very low in sulphur. Pitch coke has proved itself well adapted to foundry use and often commands a premium over coke made from coal. The manufacture of pitch coke is established commercially but has not yet reached the stage where publication of statistics on the subject is expedient.

LOW-TEMPERATURE COKE

In the United States, as elsewhere, much experimental work has been done in the field of low-temperature carbonization. The quantity of coke produced by low-temperature methods, however, is not yet significant.

BEEHIVE AND BY-PRODUCT COKE

Petroleum coke, gas-house coke, and low-temperature coke are not adapted for metallurgical purposes, the use that consumes the great bulk of all coke produced, and the production of coal-tar coke is so limited as to be of small importance. Practically, therefore, the coke trade is concerned only with beehive and by-product coke, and the statistics of this report are confined to these two types. Although their products are interchangeable, there are fundamental differences between the beehive and by-product industries which must be kept in mind when the tables in this chapter are examined. The competitive relations between the beehive and by-product industries have been discussed in previous reports of this series and need not be treated here. (See Coke and By-products in 1924, pp. 666–667.) Market conditions continue to foster the development of by-product coking, and the manufacture of beehive coke assumes more and more the character of an auxiliary agency called upon to furnish only the peak requirements of the metallurgical industry in times of active business.

BY-PRODUCT OVENS OPERATED BY CITY GAS COMPANIES INCLUDED

Between the by-product coke and the coal-gas industries the line is increasingly difficult to draw. Adaptation of the by-product coke oven to the needs of city gas manufacture has led a number of gas companies to install batteries of by-product ovens to supplement or even replace their coal or water gas plants. From the point of view of ownership and accounting these installations are a part of the gas utility system, and the Bureau of the Census therefore groups them with the manufactured-gas industry under the title "Gas manufactured, illuminating and heating."

But from other points of view these installations belong to the by-product coke industry. The coke they produce is superior to gas-house coke. In the practical operation of a by-product coke plant the fact that the gas may be distributed through city mains is of less consequence than that the coke must be marketed for foundry, furnace, or household use. Considered with reference to oven design and the technique of manufacture, and still more with reference to the supply and demand for coke, they should be included with other by-product coke plants, and they are so included in the statistics published by the Bureau of Mines.

These differences in classification are followed advisedly by the Bureau of the Census and the Bureau of Mines after consultation with leaders of the gas and coke industries, and the two offices have collaborated in the collection and analysis of the statistics. In order to enable the reader to reconcile the two sets of figures and to ascertain the total production of gas and coke from all sources without duplication, tables are given on pages 683 to 684 of this report, in which the production of those by-product ovens operated by city gas companies is shown separately.

COKE AND COKE BREEZE

GROWTH OF INDUSTRY

TABLE 3.—*By-product and beehive coke produced in the United States, 1880–1927*

Year	By-product	Beehive	Total	Year	By-product	Beehive	Total
1880		3, 338, 300	3, 338, 300	1904	2, 608, 229	21, 052, 877	23, 661, 106
1881		4, 113, 760	4, 113, 760	1905	3, 462, 348	28, 768, 781	32, 231, 129
1882		4, 793, 321	4, 793, 321	1906	4, 558, 127	31, 843, 090	36, 401, 217
1883		5, 464, 721	5, 464, 721	1907	5, 607, 899	35, 171, 665	40, 779, 564
1884		4, 873, 805	4, 873, 805	1908	4, 201, 226	21, 832, 292	26, 033, 518
1885		5, 106, 696	5, 106, 696	1909	6, 254, 644	33, 060, 421	39, 315, 065
1886		6, 845, 369	6, 845, 369	1910	7, 138, 734	34, 570, 076	41, 708, 810
1887		7, 611, 705	7, 611, 705	1911	7, 847, 845	27, 703, 644	35, 551, 489
1888		8, 540, 030	8, 540, 030	1912	11, 115, 164	32, 868, 435	43, 983, 599
1889		10, 258, 022	10, 258, 022	1913	12, 714, 700	33, 584, 830	46, 299, 530
1890		11, 508, 021	11, 508, 021	1914	11, 219, 943	23, 335, 971	34, 555, 914
1891		10, 352, 688	10, 352, 688	1915	14, 072, 895	27, 508, 255	41, 581, 150
1892		12, 010, 829	12, 010, 829	1916	19, 069, 361	35, 464, 224	54, 533, 585
1893	12, 850	9, 464, 730	9, 477, 580	1917	22, 439, 280	33, 167, 548	55, 606, 828
1894	16, 500	9, 187, 132	9, 203, 632	1918	25, 997, 580	30, 480, 792	56, 478, 372
1895	18, 521	13, 315, 193	13, 333, 714	1919	25, 137, 621	19, 042, 936	44, 180, 557
1896	83, 038	11, 705, 735	11, 788, 773	1920	30, 833, 951	20, 511, 092	51, 345, 043
1897	261, 912	13, 027, 072	13, 288, 984	1921	19, 749, 580	5, 538, 042	25, 287, 622
1898	294, 445	15, 752, 764	16, 047, 209	1922	28, 550, 545	8, 573, 467	37, 124, 012
1899	906, 534	18, 762, 035	19, 668, 569	1923	37, 597, 664	19, 379, 870	56, 977, 534
1900	1, 075, 727	19, 457, 621	20, 533, 348	1924	33, 983, 568	10, 286, 037	44, 269, 605
1901	1, 179, 900	20, 615, 983	21, 795, 883	1925	39, 912, 159	11, 354, 784	51, 266, 943
1902	1, 403, 588	23, 998, 142	25, 401, 730	1926	44, 376, 586	12, 488, 951	56, 865, 537
1903	1, 882, 394	23, 391, 887	25, 274, 281	1927	43, 884, 726	7, 207, 417	51, 092, 143

TABLE 4.—*Concise statistical summary illustrating growth of the coke industry in the United States, 1880–1927*

Year	Production (million net tons)			Per cent of total production from by-product ovens	Number of ovens in existence		Number of by-product ovens under construction at end of year	Coal charged (million net tons)	Yield of coke from coal (per cent)	Average value of coke per ton at plant	Total value at plant (million dollars)			
	By-product	Beehive	Total		By-product	Beehive					Beehive coke	By-product coke	All by-products[1]	Total coke and by-products
1880		3. 3	3. 3			12, 372		5. 2	63. 7	$1. 99	7			7
1881		4. 1	4. 1			14, 119		6. 5	62. 8	1. 88	8			8
1882		4. 8	4. 8			16, 356		7. 6	63. 3	1. 77	8			8
1883		5. 5	5. 5			18, 304		8. 5	64. 2	1. 49	8			8
1884		4. 9	4. 9			19, 557		8. 0	61. 3	1. 49	7			7
1885		5. 1	5. 1			20, 116		8. 1	63. 3	1. 49	8			8
1886		6. 8	6. 8			22, 597		10. 7	64. 0	1. 63	11			11
1887		7. 6	7. 6			26, 001		11. 9	64. 2	2. 01	15			15
1888		8. 5	8. 5			30, 059		12. 9	66. 0	1. 46	12			12
1889		10. 3	10. 3			34, 165		16. 0	64. 3	1. 62	17			17

[1] The value for tar up to and including 1917 represented that of the tar "obtained and sold," which did not always include the value of tar used by the producer. Beginning with 1918, tar used by the producer is specifically included. The value of breeze produced at by-product plants is included for those years for which it was reported, namely, 1916, 1917, and 1919–1927. The value of breeze produced at beehive plants is not included, as it has usually been much less than a million dollars.

TABLE 4.—*Concise statistical summary illustrating growth of the coke industry in the United States, 1880–1927*—Continued

Year	Production (million net tons)			Per cent of total production from by-product ovens	Number of ovens in existence		Number of by-product ovens under construction at end of year	Coal charged (million net tons)	Yield of coke from coal (per cent)	Average value of coke per ton at plant	Total value at plant (million dollars)			
	By-product	Beehive	Total		By-product	Beehive					Beehive coke	By-product coke	All by-products	Total coke and by-products
1890	------	11.5	11.5	------	--------	37,158	-------	18.0	63.9	$2.02	23	------	------	23
1891	------	10.4	10.4	------	--------	40,057	-------	16.3	63.3	1.97	20	------	------	20
1892	------	12.0	12.0	------	--------	42,002	-------	18.8	63.8	1.96	24	------	------	24
1893	0.01	9.5	9.5	0.1	12	44,189	-------	14.9	63.5	1.74	17		(2)	(2)
1894	.02	9.2	9.2	.2	12	44,760	60	14.4	64.0	1.34	12		(2)	(2)
1895	.02	13.3	13.3	.1	72	45,493	60	20.8	64.0	1.44	19		(2)	(2)
1896	.1	11.7	11.8	.7	160	46,784	120	18.7	63.1	1.84	22		(2)	(2)
1897	.3	13.0	13.3	2.0	280	47,388	240	20.9	63.6	1.66	22		(2)	(2)
1898	.3	15.7	16.0	1.8	520	47,863	500	25.2	63.6	1.59	26		(2)	(2)
1899	.9	18.8	19.7	4.6	1,020	48,583	65	30.2	65.1	1.76	35		(2)	(2)
1900	1.1	19.4	20.5	5.2	1,085	57,399	1,096	32.1	63.9	2.31	47		(2)	(2)
1901	1.2	20.6	21.8	5.4	1,165	62,786	1,533	34.2	63.7	2.04	44		------	------
1902	1.4	24.0	25.4	5.5	1,663	67,406	1,346	39.6	64.1	2.49	63		(2)	(2)
1903	1.9	23.4	25.3	7.4	1,956	77,378	1,335	39.4	64.1	2.63	66		(2)	(2)
1904	2.6	21.1	23.7	11.0	2,910	80,689	832	36.5	64.8	1.95	46		(2)	(2)
1905	3.4	28.8	32.2	10.7	3,103	84,405	417	49.5	65.1	2.25	72		(2)	(2)
1906	4.6	31.8	36.4	12.5	3,547	90,354	112	55.7	65.3	2.52	92		(2)	(2)
1907	5.6	35.2	40.8	13.8	3,684	95,996	330	61.9	65.8	2.74	90	22	8	120
1908	4.2	21.8	26.0	16.1	3,799	97,419	240	39.4	66.0	2.40	48	14	7	69
1909	6.2	33.1	39.3	15.9	3,989	99,993	949	59.4	66.2	2.29	70	20	8	98
1910	7.1	34.6	41.7	17.1	4,078	100,362	1,200	63.1	66.1	2.39	75	25	8	108
1911	7.9	27.7	35.6	22.1	4,624	99,255	698	53.3	66.7	2.37	57	27	10	94
1912	11.1	32.9	44.0	25.3	5,211	97,019	793	65.6	67.1	2.54	69	43	14	126
1913	12.7	33.6	46.3	27.5	5,688	96,962	504	69.2	66.9	2.78	80	49	17	146
1914	11.2	23.4	34.6	32.5	5,809	93,946	644	51.6	66.9	2.56	50	38	18	106
1915	14.1	27.5	41.6	33.8	6,268	93,110	1,191	61.8	67.2	2.54	57	49	30	136
1916	19.1	35.4	54.5	35.0	7,283	91,581	2,084	81.6	66.8	3.13	96	75	62	233
1917	22.4	33.2	55.6	40.4	7,869	88,027	2,260	83.8	66.4	5.36	159	139	68	366
1918	26.0	30.5	56.5	46.0	9,279	84,635	1,815	85.0	66.4	6.77	189	193	77	459
1919	25.1	19.1	44.2	56.9	10,379	82,560	877	65.6	67.4	5.85	98	160	68	326
1920	30.8	20.5	51.3	60.0	10,881	75,298	396	76.2	67.4	9.27	163	313	105	581
1921	19.8	5.5	25.3	78.1	11,142	66,014	85	37.2	68.0	5.84	30	118	68	216
1922	28.5	8.6	37.1	76.9	11,212	63,958	403	54.3	68.3	6.42	50	188	95	333
1923	37.6	19.4	57.0	66.0	11,156	62,349	629	84.4	67.5	6.56	116	257	131	504
1924	34.0	10.3	44.3	76.8	11,413	60,432	247	65.0	68.1	5.51	48	196	120	364
1925	39.9	11.4	51.3	77.9	11,290	57,587	429	74.5	68.8	5.12	52	211	143	406
1926	44.4	12.5	56.9	78.0	11,716	52,558	978	82.9	68.6	5.41	57	251	157	465
1927	43.9	7.2	51.1	85.9	12,475	49,795	289	74.4	68.6	5.13	30	232	160	422

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[2] No accurate data on the value of the by-products available.

MONTHLY AND WEEKLY PRODUCTION

Figures for monthly and weekly production of coke are given in Tables 5 to 8. The monthly statistics of by-product coke are based on reports from the producers themselves. From 1917 to date the reports are practically complete; for the five years earlier (1912 to 1916) monthly data were obtained from the great majority of the producers, and estimates were included for the few plants remaining. No data on the monthly production of by-product coke prior to 1912 are available.

The current statistics of beehive coke are estimates based on reports of cars of coke loaded for shipment by the principal coke-carrying roads. The reports are now received weekly and are here shown adjusted to a monthly basis. As beehive coke is ordinarily not stored at the ovens in any great quantity, the shipments are an excellent indicator of weekly production. The estimates also allow for shipments over the Monongahela River and other waterways and over private railroads and for amounts consumed by associated steelworks close to the ovens.

The estimates thus obtained are published currently in the weekly coal reports of the Bureau of Mines. At the end of the year, if the total of the current estimates does not exactly equal the actual production as reported to the bureau by the operators, a slight adjustment in the current figures is made. The data in the accompanying tables have been revised in this way.

TABLE 5.—*By-product, beehive, and total coke produced in the United States, 1924–1927, by months, and average per day, in net tons*

Month	1924		1925		1926		1927	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
By-product:								
January	3,093,000	99,800	3,404,000	109,800	3,796,000	122,500	3,706,000	119,500
February	2,980,000	102,800	3,118,000	111,600	3,492,000	124,700	3,429,000	122,500
March	3,220,000	103,900	3,449,000	111,300	3,772,000	121,700	3,876,000	125,000
April	3,009,000	100,300	3,308,000	110,300	3,604,000	120,100	3,705,000	123,500
May	2,807,000	90,500	3,280,000	105,800	3,725,000	120,200	3,785,000	122,100
June	2,425,000	80,800	3,151,000	105,000	3,614,000	120,500	3,594,000	119,800
July	2,369,000	76,400	3,167,000	102,200	3,771,000	121,600	3,655,000	117,900
August	2,445,000	78,900	3,159,000	101,900	3,742,000	120,700	3,677,000	118,600
September	2,545,000	84,800	3,178,000	105,900	3,640,000	121,300	3,601,000	120,000
October	2,899,000	93,500	3,395,000	109,500	3,799,000	122,500	3,717,000	119,900
November	2,926,000	97,500	3,550,000	118,300	3,730,000	124,300	3,497,000	116,600
December	3,266,000	105,400	3,753,000	121,100	3,692,000	119,100	3,643,000	117,500
	33,984,000	93,100	39,912,000	109,300	44,377,000	121,600	43,885,000	120,200
Beehive:								
January	1,228,000	45,500	1,241,000	46,000	1,500,000	57,700	810,000	31,200
February	1,288,000	51,500	1,117,000	46,500	1,524,000	63,500	776,000	32,300
March	1,429,000	55,000	1,066,000	41,000	1,259,000	46,600	916,000	33,900
April	1,148,000	44,000	854,000	32,800	1,068,000	41,100	802,000	30,800
May	810,000	30,000	710,000	27,300	964,000	37,100	648,000	24,900
June	590,000	23,600	632,000	24,300	882,000	33,900	596,000	22,900
July	476,000	18,300	561,000	21,600	856,000	32,900	480,000	19,200
August	462,000	17,800	641,000	24,700	818,000	31,500	500,000	18,500
September	556,000	21,400	794,000	30,500	892,000	34,300	470,000	18,100
October	671,000	24,900	1,068,000	39,600	943,000	36,300	431,000	16,600
November	670,000	26,800	1,286,000	51,400	935,000	36,000	390,000	15,000
December	958,000	36,800	1,385,000	53,300	848,000	32,600	388,000	14,900
	10,286,000	33,000	11,355,000	36,500	12,489,000	40,200	7,207,000	23,200
Total coke:								
January	4,321,000	145,300	4,645,000	155,800	5,296,000	180,200	4,516,000	150,700
February	4,268,000	154,300	4,235,000	158,100	5,016,000	188,200	4,205,000	154,800
March	4,649,000	158,900	4,515,000	152,300	5,031,000	168,300	4,792,000	158,900
April	4,157,000	144,300	4,162,000	143,100	4,672,000	161,200	4,507,000	154,300
May	3,617,000	120,500	3,990,000	133,100	4,689,000	157,300	4,433,000	147,000
June	3,015,000	104,400	3,783,000	129,300	4,496,000	154,400	4,190,000	142,700
July	2,845,000	94,700	3,728,000	123,800	4,627,000	154,500	4,135,000	137,100
August	2,907,000	96,700	3,800,000	126,600	4,560,000	152,200	4,177,000	137,100
September	3,101,000	106,200	3,972,000	136,400	4,532,000	155,600	4,071,000	138,100
October	3,570,000	118,400	4,463,000	149,100	4,742,000	158,800	4,148,000	136,500
November	3,596,000	124,300	4,836,000	169,700	4,665,000	160,300	3,887,000	131,600
December	4,224,000	142,200	5,138,000	174,400	4,540,000	151,700	4,031,000	132,400
	44,270,000	126,100	51,267,000	145,800	56,866,000	161,800	51,092,000	143,400

TABLE 6.—*Coke shipped from the Connellsville and Lower Connellsville districts, Pennsylvania, 1920–1927, by months, in net tons* [1]

Month	1920	1921	1922	1923	1924	1925	1926	1927
January	1,082,289	735,897	377,003	1,046,630	937,790	904,110	1,004,330	570,720
February	967,122	552,568	397,537	1,048,425	921,070	795,690	934,060	552,150
March	1,110,550	361,646	584,497	1,292,435	1,024,770	785,080	856,600	630,990
April	799,578	198,966	377,433	1,270,355	800,420	583,740	756,170	579,330
May	749,537	186,256	247,145	1,342,545	504,740	349,400	672,550	468,340
June	796,698	130,324	276,304	1,306,750	303,370	325,800	602,690	401,310
July	778,345	92,880	283,472	1,196,660	243,090	265,780	555,440	302,280
August	909,270	158,250	371,499	1,144,790	205,430	414,510	545,850	306,000
September	879,297	188,664	451,240	1,005,200	263,520	513,590	603,680	273,290
October	921,753	257,499	628,333	914,800	329,430	673,920	642,310	222,280
November	889,173	303,532	799,087	781,690	451,950	830,460	609,010	187,320
December	854,615	405,935	872,950	754,060	668,980	953,040	559,640	187,690
	10,738,227	3,572,417	5,666,500	13,104,340	6,654,560	7,395,120	8,342,330	4,681,700

[1] From the Connellsville Courier.

TABLE 7.—*Beehive coke produced in the United States in 1927, by weeks*

[Estimated from railroad shipments]

Week ended—	Net tons	Week ended—	Net tons	Week ended—	Net tons
Jan. 1 [1]	29,000	May 14	151,000	Sept. 24	110,000
Jan. 8	175,000	May 21	159,000	Oct. 1	104,000
Jan. 15	186,000	May 28	129,000	Oct. 8	111,000
Jan. 22	192,000	June 4	153,000	Oct. 15	91,000
Jan. 29	195,000	June 11	145,000	Oct. 22	108,000
Feb. 5	192,000	June 18	141,000	Oct. 29	87,000
Feb. 12	193,000	June 25	134,000	Nov. 5	97,000
Feb. 19	196,000	July 2	109,000	Nov. 12	93,000
Feb. 26	194,000	July 9	118,000	Nov. 19	84,000
Mar. 5	195,000	July 16	109,000	Nov. 26	88,000
Mar. 12	202,000	July 23	110,000	Dec. 3	87,000
Mar. 19	211,000	July 30	109,000	Dec. 10	84,000
Mar. 26	206,000	Aug. 6	110,000	Dec. 17	86,000
Apr. 2	202,000	Aug. 13	113,000	Dec. 24	89,000
Apr. 9	199,000	Aug. 20	111,000	Dec. 31	86,000
Apr. 16	181,000	Aug. 27	113,000		
Apr. 23	174,000	Sept. 3	108,000		7,207,000
Apr. 30	181,000	Sept. 10	115,000		
May 7	158,000	Sept. 17	104,000		

[1] 1 day only.

TABLE 8.—*By-product coke produced in the United States in 1927, by months and by States, in net tons* [1]

State	January	February	March	April	May	June	July
Alabama	374,000	361,000	403,000	383,000	386,000	354,000	353,000
Colorado	50,000	47,000	53,000	51,000	53,000	51,000	53,000
Illinois	242,000	236,000	262,000	240,000	251,000	249,000	256,000
Indiana	465,000	441,000	520,000	527,000	557,000	513,000	469,000
Maryland	95,000	89,000	100,000	96,000	102,000	80,000	80,000
Massachusetts	72,000	61,000	68,000	59,000	61,000	57,000	62,000
Michigan	153,000	134,000	148,000	139,000	143,000	141,000	156,000
Minnesota	55,000	48,000	53,000	52,000	52,000	52,000	54,000
New Jersey	80,000	72,000	80,000	70,000	61,000	69,000	80,000
New York	276,000	260,000	297,000	284,000	299,000	292,000	300,000
Ohio	591,000	552,000	623,000	581,000	592,000	600,000	623,000
Pennsylvania	970,000	875,000	987,000	960,000	957,000	875,000	898,000
Tennessee	11,000	10,000	11,000	10,000	11,000	10,000	10,000
Utah	17,000	15,000	18,000	16,000	16,000	16,000	17,000
Washington	4,000	3,000	4,000	3,000	4,000	3,000	4,000
West Virginia	123,000	110,000	121,000	117,000	120,000	115,000	118,000
Kentucky, Missouri, Rhode Island, and Wisconsin	128,000	115,000	128,000	117,000	120,000	117,000	122,000
	3,706,000	3,429,000	3,876,000	3,705,000	3,785,000	3,594,000	3,655,000

[1] Based upon reports from all producers.

TABLE 8.—*By-product coke produced in the United States in 1927, by months and by States, in net tons*—Continued

State	August	September	October	November	December	Total
Alabama	357,000	344,000	359,000	335,000	355,000	4,364,000
Colorado	51,000	51,000	50,000	37,000	48,000	595,000
Illinois	251,000	249,000	260,000	255,000	263,000	3,014,000
Indiana	445,000	431,000	397,000	371,000	414,000	5,550,000
Maryland	81,000	74,000	91,000	92,000	97,000	1,077,000
Massachusetts	61,000	60,000	63,000	60,000	60,000	744,000
Michigan	165,000	165,000	197,000	193,000	186,000	1,920,000
Minnesota	54,000	51,000	54,000	54,000	54,000	633,000
New Jersey	80,000	78,000	80,000	77,000	79,000	906,000
New York	310,000	322,000	325,000	316,000	322,000	3,603,000
Ohio	638,000	625,000	643,000	587,000	559,000	7,214,000
Pennsylvania	915,000	890,000	929,000	867,000	938,000	11,061,000
Tennessee	10,000	9,000	10,000	10,000	10,000	122,000
Utah	17,000	16,000	17,000	16,000	16,000	197,000
Washington	3,000	3,000	4,000	3,000	3,000	41,000
West Virginia	117,000	112,000	114,000	110,000	119,000	1,396,000
Kentucky, Missouri, Rhode Island, and Wisconsin	122,000	121,000	124,000	114,000	120,000	1,448,000
	3,677,000	3,601,000	3,717,000	3,497,000	3,643,000	43,885,000

PRODUCTION BY FURNACE AND NONFURNACE PLANTS

Tables 9 to 11 give the production of by-product coke by plants associated with iron furnaces and by other plants.

The terms "furnace" and "merchant" operators originated in the Connellsville beehive-coke trade. As the name implies, the beehive-furnace interests are those affiliated with the producers of iron and steel and whose output does not ordinarily enter the open market. In the by-product industry, however, it is not always easy to classify a particular plant. There are by-product plants financially affiliated with iron furnaces, in which the bulk of the product is nevertheless foundry and domestic coke which must be sold on the competitive market. There have been other plants—entirely independent of iron furnaces in point of ownership—that nevertheless were operated under contract to produce furnace coke exclusively for an adjacent iron works.

A "furnace" plant is now defined as one that has for its main business the production of furnace coke and that has an assured outlet for its furnace coke either through financial affiliation with or direct ownership by an ironworks, or through long-time contracts.

Under this definition the class of "other" plants includes a few plants affiliated with local iron furnaces but producing much more coke than the furnaces can absorb and therefore depending chiefly on the foundry and domestic trade or on merchant sales of furnace coke. It also includes merchant producers of furnace coke who have to sell their output on the competitive market; it includes the plants affiliated with alkali works; it includes all those operated as gas utilities; and it includes the growing number of plants, which, though not public utilities, have been constructed primarily to supply city gas and which must sell their coke where they can for domestic and industrial as well as metallurgical use. Because of the miscellaneous character of this group of plants, it is thought best to designate them not as "merchant" but as "nonfurnace" or "other" plants.

TABLE 9.—*Number and production of by-product coke plants connected with iron furnaces and of other by-product plants, 1913–1927*

Year	Number of active plants		Coke produced (net tons)		Percentage of production	
	Furnace plants	Other plants	Furnace plants	Other plants	Furnace plants	Other plants
1913	20	16	9,277,832	3,436,868	73.0	27.0
1914	22	15	7,832,950	3,386,993	69.8	30.2
1915	23	17	10,206,434	3,866,461	72.5	27.5
1916	28	18	14,006,214	5,063,147	73.4	26.6
1917	31	21	16,607,870	5,831,410	74.0	26.0
1918	36	24	19,220,342	6,777,238	73.9	26.1
1919	40	25	19,135,587	6,002,034	76.1	23.9
1920	42	26	24,257,128	6,576,823	78.7	21.3
1921	42	25	15,878,899	3,870,681	80.4	19.6
1922	39	25	22,850,186	5,700,359	80.0	20.0
1923	40	25	29,660,369	7,937,295	78.9	21.1
1924	42	29	26,919,283	7,064,285	79.2	20.8
1925	43	31	31,494,030	8,418,129	78.9	21.1
1926	43	35	34,714,462	9,662,124	78.2	21.8
1927	44	35	34,110,858	9,773,868	77.7	22.3

TABLE 10.—*Monthly and average daily production of by-product coke by plants associated with iron furnaces and by all other plants, 1925–1927, in net tons*

	1925		1926		1927	
	Furnace plants	Other plants	Furnace plants	Other plants	Furnace plants	Other plants
Monthly production:						
January	2,748,000	656,000	2,974,000	822,000	2,879,000	827,000
February	2,476,000	642,000	2,693,000	799,000	2,675,000	754,000
March	2,737,000	712,000	2,942,000	830,000	3,040,000	836,000
April	2,628,000	680,000	2,826,000	778,000	2,939,000	766,000
May	2,591,000	689,000	2,921,000	804,000	3,003,000	782,000
June	2,488,000	663,000	2,828,000	786,000	2,812,000	782,000
July	2,476,000	691,000	2,979,000	792,000	2,818,000	837,000
August	2,453,000	706,000	2,943,000	799,000	2,832,000	845,000
September	2,481,000	697,000	2,851,000	789,000	2,772,000	829,000
October	2,652,000	743,000	2,971,000	828,000	2,856,000	861,000
November	2,807,000	743,000	2,918,000	812,000	2,688,000	809,000
December	2,957,000	796,000	2,869,000	823,000	2,797,000	846,000
	31,494,000	8,418,000	34,715,000	9,662,000	34,111,000	9,774,000
Average daily production:						
January	89,000	21,000	96,000	27,000	92,900	26,600
February	88,000	23,000	96,000	29,000	95,600	26,900
March	88,000	23,000	95,000	27,000	98,000	27,000
April	87,000	23,000	94,000	26,000	98,000	25,500
May	84,000	22,000	94,000	26,000	96,900	25,200
June	83,000	22,000	94,000	26,000	93,700	26,100
July	80,000	22,000	96,000	26,000	90,900	27,000
August	79,000	23,000	95,000	26,000	91,300	27,300
September	83,000	23,000	95,000	26,000	92,400	27,600
October	86,000	24,000	96,000	27,000	92,100	27,800
November	93,000	25,000	97,000	27,000	89,600	27,000
December	95,000	26,000	92,000	27,000	90,200	27,300
Average	86,000	23,000	95,000	26,000	93,400	26,800

TABLE 11.—*Percentage of total monthly output of by-product coke produced by plants associated with iron furnaces and by other plants, 1924–1927*

Month	1924		1925		1926		1927	
	Furnace plants	Other plants	Furnace plants	Other plants	Furnace plants	Other plants	Furnace plants	Other plants
January	79.3	20.7	80.7	19.3	78.3	21.7	77.7	22.3
February	79.6	20.4	79.4	20.6	77.1	22.9	78.0	22.0
March	80.1	19.9	79.4	20.6	78.0	22.0	78.4	21.6
April	80.1	19.9	79.5	20.5	78.4	21.6	79.3	20.7
May	78.6	21.4	79.0	21.0	78.4	21.6	79.3	20.7
June	76.7	23.3	78.9	21.1	78.3	21.7	78.2	21.8
July	77.2	22.8	78.2	21.8	79.0	21.0	77.1	22.9
August	78.1	21.9	77.7	22.3	78.7	21.3	77.0	23.0
September	78.8	21.2	78.1	21.9	78.3	21.7	77.0	23.0
October	79.8	20.2	78.1	21.9	78.2	21.8	76.8	23.2
November	79.9	20.1	79.1	20.9	78.2	21.8	76.9	23.1
December	81.1	18.9	78.8	21.2	77.7	22.3	76.8	23.2
Average	79.2	20.8	78.9	21.1	78.2	21.8	77.7	22.3

PRODUCTION BY STATES AND DISTRICTS

TABLE 12.—*By-product and beehive coke produced, by States, 1918 and 1924–1927, in net tons*

State	1918	1924	1925	1926	1927
By-product:					
Alabama	2,634,451	4,386,372	4,582,153	4,779,986	4,364,354
Colorado	230,663	523,405	489,657	592,939	594,402
Illinois	2,285,610	2,355,474	3,011,497	3,336,962	3,013,940
Indiana	3,898,215	4,272,435	5,141,940	5,990,344	5,549,762
Kentucky	517,749	(1)	(1)	(1)	(1)
Maryland	474,368	810,118	1,019,209	1,120,610	1,077,309
Massachusetts	556,397	397,640	535,302	573,748	744,091
Michigan	(1)	1,770,547	1,751,118	1,826,638	1,920,394
Minnesota	784,065	514,764	518,355	619,905	632,628
Missouri	(1)	(1)	(1)	(1)	(1)
New Jersey	682,148	869,120	903,997	913,250	906,321
New York	1,069,587	1,600,669	2,219,409	2,827,805	3,602,642
Ohio	5,226,334	5,723,074	7,105,129	7,547,836	7,213,619
Pennsylvania	4,586,981	8,426,155	9,853,262	11,200,624	11,061,084
Rhode Island	------------	(1)	(1)	(1)	(1)
Tennessee	124,469	75,720	88,879	118,624	122,312
Utah	------------	97,350	168,150	184,756	197,183
Washington	30,129	39,903	40,757	42,584	40,570
West Virginia	603,393	998,914	1,055,992	1,129,862	1,396,285
Wisconsin	(1)	(1)	(1)	(1)	(1)
Combined States	2,293,021	1,121,908	1,427,353	1,570,113	1,447,830
	25,997,580	33,983,568	39,912,159	44,376,586	43,884,726
Beehive:					
Alabama	1,717,721	154,686	88,328	(1)	------------
Colorado	758,784	212,115	154,824	197,179	194,184
Georgia	22,048	8,081	4,925	3,059	(1)
Kentucky	301,036	79,248	(1)	147,540	(1)
New Mexico	597,072	83,070	(1)	(1)	------------
Ohio	138,909	109,625	156,058	84,970	(1)
Oklahoma	(1)	------------	------------	------------	------------
Pennsylvania	22,136,664	8,501,282	9,574,341	10,722,352	5,716,207
Tennessee	302,637	131,755	127,609	122,410	104,808
Utah	(1)	159,744	146,009	121,475	84,865
Virginia	1,234,256	485,064	421,691	370,983	316,754
Washington	93,659	31,712	38,500	24,702	30,701
West Virginia	2,716,613	329,655	490,040	583,599	527,142
Combined States	461,393	------------	152,459	110,682	232,756
	30,480,792	10,286,037	11,354,784	12,488,951	7,207,417
Grand total	56,478,372	44,269,605	51,266,943	56,865,537	51,092,143

[1] Included under "Combined States."

TABLE 13.—*Rank of States in the production of coke, 1923–1927*

State	1923	1924	1925	1926	1927	State	1923	1924	1925	1926	1927
Pennsylvania	1	1	1	1	1	Minnesota	12	12	15	13	13
Ohio	2	2	2	2	2	Wisconsin	14	14	13	14	14
Indiana	3	4	3	3	3	Kentucky	15	16	12	12	15
Alabama	4	3	4	4	4	Virginia	11	13	16	16	16
New York	6	7	6	6	5	Utah	19	17	17	17	17
Illinois	5	5	5	5	6	Missouri	18	18	18	18	18
West Virginia	7	8	8	8	7	Tennessee	17	19	19	19	19
Michigan	8	6	7	7	8	Rhode Island	20	20	20	20	20
Maryland	10	10	9	9	9	Washington	22	22	21	21	21
New Jersey	9	9	10	10	10	Georgia	23	23	23	23	22
Colorado	13	11	11	11	11	New Mexico	21	21	22	22	------
Massachusetts	16	15	14	15	12	Oklahoma	24	------	------	------	------

TABLE 14.—*By-product and beehive coke produced in Pennsylvania, 1926–27, by districts*

[The figures of number of plants and ovens include those that were idle during the year]

District	Plants	Ovens		Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens	
		Built	Under construction				Total	Per ton
1926								
By-product:								
Eastern Pennsylvania [1]	5	829	-------	3, 143, 867	72. 3	2, 273, 813	$12, 635, 798	$5. 56
Western Pennsylvania [2]	7	2, 297	425	13, 751, 203	64. 9	8, 926, 811	36, 087, 137	4. 04
	12	3, 126	425	16, 895, 070	66. 3	11, 200, 624	48, 722, 935	4. 35
Beehive:								
Allegheny Mountain and Allegheny Valley	8	725	-------	195, 769	58. 3	114, 061	668, 657	5. 86
Connellsville	65	15, 454	-------	7, 411, 701	66. 2	4, 905, 254	22, 279, 293	4. 54
Lower Connellsville	52	11, 458	-------	5, 889, 788	66. 9	3, 938, 159	16, 318, 593	4. 14
Pittsburgh	4	1, 553	-------	1, 004, 285	61. 3	615, 349	2, 661, 804	4. 33
Upper Connellsville	12	1, 668	-------	693, 453	59. 0	409, 437	2, 233, 491	5. 46
Other districts [3]	12	3, 517	-------	1, 149, 443	64. 4	740, 092	3, 433, 346	4. 64
	153	34, 375	-------	16, 344, 439	65. 6	10, 722, 352	47, 595, 184	4. 44
Grand total	165	37, 501	425	33, 239, 509	66. 0	21, 922, 976	96, 318, 119	4. 39
1927								
By-product:								
Eastern Pennsylvania [1]	5	829	-------	2, 849, 253	71. 0	2, 021, 848	10, 738, 680	5. 31
Western Pennsylvania [2]	7	2, 600	-------	13, 841, 727	65. 3	9, 039, 236	33, 863, 077	3. 75
	12	3, 429	-------	16, 690, 980	66. 3	11, 061, 084	44, 601, 757	4. 03
Beehive:								
Allegheny Mountain and Allegheny Valley	7	645	-------	120, 065	60. 0	72, 038	350, 754	4. 87
Connellsville	62	15, 055	-------	3, 851, 813	66. 3	2, 552, 024	10, 615, 657	4. 16
Lower Connellsville	48	11, 158	-------	3, 518, 905	66. 3	2, 333, 515	8, 083, 885	3. 46
Upper Connellsville	11	1, 427	-------	488, 150	58. 4	284, 942	1, 282, 894	4. 50
Pittsburgh and other [3] districts	14	3, 850	-------	750, 929	63. 1	473, 688	2, 235, 128	4. 72
	142	32, 135	-------	8, 729, 862	65. 5	5, 716, 207	22, 568, 318	3. 95
Grand total	154	35, 564	-------	25, 420, 842	66. 0	16, 777, 291	67, 170, 075	4. 00

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[1] Includes plants at Bethlehem, Chester, Lebanon, Steelton, and Swedeland.

[2] Includes plants at Clairton, Dunbar, Erie, Johnstown, Midland, Pittsburgh, and Woodlawn.

[3] Includes Bedford, Clearfield, Huntingdon, Jefferson, and parts of Indiana and Westmoreland Counties.

TABLE 15.—*By-product and beehive coke produced in Ohio, 1926–27, by districts*

District	Plants	Ovens		Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens	
		Built	Under construction				Total	Per ton
1926								
By-product:								
Canton and Cleveland	4	531	49	3,428,260	70.0	2,398,604	$12,910,087	$5.38
Youngstown	3	594	-------	3,504,498	65.4	2,292,061	13,231,869	5.77
Other districts [1]	7	564	40	4,029,965	70.9	2,857,171	14,202,568	4.97
	14	1,689	89	10,962,723	68.9	7,547,836	40,344,524	5.35
Beehive	2	204	-------	125,883	67.5	84,970	(2)	(2)
Grand total	16	1,893	89	11,088,606	68.8	7,632,806	(2)	(2)
1927								
By-product:								
Canton, Cleveland, and Massillon	5	580	-------	3,697,110	69.9	2,584,773	12,651,543	4.89
Youngstown	3	594	-------	3,088,197	64.9	2,005,393	8,987,632	4.48
Other districts [1]	7	604	-------	3,685,226	71.2	2,623,453	13,045,290	4.97
	15	1,778	-------	10,470,533	68.9	7,213,619	34,684,465	4.81
Beehive	2	204	-------	(2)	(2)	(2)	(2)	(2)
Grand total	17	1,982	-------	(2)	(2)	(2)	(2)	(2)

[1] Includes plants at Dover, Ironton, Lorain, Painesville, Portsmouth, Toledo, and Warren.
[2] Not at liberty to publish.

TABLE 16.—*By-product and beehive coke produced in West Virginia, 1926–27, by districts*

[The figures of number of plants and ovens include those that were idle during the year]

District	Plants	Ovens		Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens	
		Built	Under construction				Total	Per ton
1926								
By-product: Fairmont, Benwood, Follansbee, and Weirton	4	[1] 411	-------	1,632,790	69.2	1,129,862	$4,265,884	$3.78
Beehive:								
Flat Top	10	1,606	-------	299,842	60.1	180,185	779,234	4.32
Tug River	1	1,885	-------	------------	-------	------------	------------	------
Kanawha	4	583	-------	178,594	60.7	108,363	398,179	3.67
New River	7	704	-------	219,164	59.2	129,834	759,111	5.85
Upper Monongahela and Panhandle	17	1,524	-------	154,337	62.0	95,716	445,624	4.66
Upper Potomac and Tygarts Valley	7	851	-------	105,092	66.1	69,501	270,071	3.89
	46	7,153	-------	957,029	61.0	583,599	2,652,219	4.54
Grand total	50	7,564	-------	2,589,819	66.2	1,713,461	6,918,103	4.04
1927								
By-product: Fairmont, Benwood, Follansbee, and Weirton	4	[1] 411	-------	2,065,812	67.6	1,396,285	4,679,048	3.35
Beehive:								
Flat Top	11	1,621	-------	220,084	56.6	124,524	543,207	4.36
Tug River	1	1,885	-------	------------	-------	------------	------------	------
Kanawha, Upper Monongahela, and Panhandle	21	2,107	-------	373,690	60.1	224,606	758,293	3.38
New River	7	704	-------	240,305	58.4	140,401	743,429	5.30
Upper Potomac and Tygarts Valley	7	582	-------	63,964	58.8	37,611	116,381	3.09
	47	6,899	-------	898,043	58.7	527,142	2,161,310	4.10
Grand total	51	7,310	-------	2,963,855	64.9	1,923,427	6,840,358	3.56

[1] Includes 291 Koppers and 120 Semet-Solvay ovens.

NUMBER AND TYPE OF OVENS

TABLE 17.—*By-product coke ovens built and under construction at end of each year, by States, 1924–1927*

State	1924		1925		1926		1927	
	Built	Under construction	Built	Under construction	Built	Under construction	Built	Under construction
Alabama	1,196	25	1,276		1,276	112	1,325	63
Colorado	120		120		120		120	
Connecticut								61
Illinois	739	110	849		849		849	101
Indiana	1,133	19	1,177	212	1,394	40	1,384	
Maryland	300		300		300	60	360	
Massachusetts	400	11	419		466	15	481	
Michigan	420	2	420	2	420	120	561	
Minnesota	220		220		220		215	41
New Jersey	202		206		207		207	
New York	686	55	506	155	661	[1] 117	778	
Ohio	1,689		1,689		1,689	89	1,778	
Pennsylvania	3,420	25	3,220	60	3,126	425	3,429	
Tennessee	24		24		24		24	
Utah	33		33		33		33	23
Washington	20		20		20		20	
West Virginia	311		311		411		411	
Kentucky, Missouri, Rhode Island, and Wisconsin	500		500		500		500	
	11,413	247	11,290	429	11,716	[1] 978	12,475	289

[1] Includes information published in Iron Age, Jan. 20, 1927, p. 257, as to ovens under construction at 1 plant.

TABLE 18.—*Beehive coke ovens at end of each year, by States, 1922–1927*

State	1922	1923	1924	1925	1926	1927	
						Built	Under construction
Alabama	6,460	6,199	6,199	4,961	1,831	1,831	
Colorado	1,758	1,758	1,696	1,681	1,527	1,498	
Georgia	151	151	151	151	151	151	
Kentucky	795	795	795	795	763	763	
New Mexico	1,030	1,030	1,030	1,030	584	584	
Ohio	205	205	205	204	204	204	
Oklahoma	300	300	300	300	300	100	
Pennsylvania	38,593	37,578	36,030	34,668	34,375	32,135	
Tennessee	1,822	1,767	1,555	1,675	1,605	1,465	
Utah	819	819	819	819	819	819	
Virginia	3,372	3,284	3,234	3,124	2,914	3,014	
Washington	408	408	408	332	332	332	
West Virginia	8,245	8,055	8,010	7,847	7,153	6,899	
	63,958	62,349	60,432	57,587	52,558	49,795	

TABLE 19.—*Coke ovens completed and abandoned in 1927 and total number in existence and under construction at end of year, by States*

State	Plants in existence	Ovens						
		New [1]		Abandoned during year	In existence Dec. 31		Under construction Dec. 31	
		Number	Capacity per day (net tons of coke)		Number	Capacity per day (net tons of coke)	Number	Capacity per day (net tons of coke)
By-product:								
Alabama	8	49	540		1,325	14,721	63	1,270
Colorado	1				120	1,700		
Connecticut							61	972
Illinois	7				849	11,820	101	1,515
Indiana	7	40	430	50	1,384	19,762		
Maryland	1	60	848	60	360	5,085		
Massachusetts	3	15	65		481	2,782		
Michigan	6	195	2,711	54	561	7,381		
Minnesota	3			5	215	2,327	41	600
New Jersey	2				207	2,495		
New York	8	117	2,158		778	11,498		
Ohio	15	89	1,375		1,778	23,971		
Pennsylvania	12	425	7,340	122	3,429	43,737		
Tennessee	1				24	365		
Utah	1				33	600	23	224
Washington	1				20	111		
West Virginia	4				411	4,501		
Kentucky, Missouri, Rhode Island, and Wisconsin	5				500	5,643		
	85	990	15,467	291	12,475	158,499	289	4,581
Beehive:								
Alabama	12				1,831	(2)		
Colorado	5			29	1,498			
Georgia	1				151			
Kentucky	3				763			
New Mexico	2				584			
Ohio	2				204			
Oklahoma	1			200	100			
Pennsylvania	142			2,238	32,135			
Tennessee	7			140	1,465			
Utah	1				819			
Virginia	13				3,014			
Washington	4				332			
West Virginia	47			269	6,899			
	240			2,876	49,795	(2)		

[1] Represents new construction. Does not include ovens repaired and put into commission.
[2] Data not available.

TABLE 20.—*By-product coke plants in the United States, December 31, 1927*

State	Town	Name of company operating plant	Type of plant [1]	Number of ovens	Type of oven	Year put in operation [2]
Alabama	Alabama City	Gulf States Steel Co	F	37	Koppers	1916
	Ensley	Semet-Solvay Co	(3)	(3)	(3)	(3)
	Fairfield	Tennessee Coal, Iron & R. R. Co.	F	434	Koppers	1912–1920
	North Birmingham.	Sloss-Sheffield Steel & Iron Co.	F	120	Semet-Solvay	1920
	Tarrant	Alabama By-Products Corp.	M	149	Koppers	1920–1927
	Thomas	Republic Iron & Steel Co	F	57	do	1925
	Tuscaloosa	Central Iron & Coal Co	F	60	Semet-Solvay	1906–1914
	Woodward	Woodward Iron Co	F	168	Koppers	1911–1914
	do	do	F	60	Wilputte	1917

[1] F, "Furnace plants," or plants associated with iron furnaces and steelworks. M, "Nonfurnace plants," or "other plants" (see Tables 9–11), including merchant plants, plants associated with industries other than iron and steel, and plants supplying gas under contract for city use. Since the publication of the report for 1925 changes in classification of certain plants have been made to conform with changes in definition of what constitutes a furnace plant.
[2] The first and last years are given for those plants that have two or more installations.
[3] Not at liberty to publish.

TABLE 20.—*By-product coke plants in the United States, December 31, 1927*—Con.

State	Town	Name of company operating plant	Type of plant	Number of ovens	Type of oven	Year put in operation
Colorado	Pueblo	Colorado Fuel & Iron Co.	F	120	Koppers	1918
Illinois	Chicago	Chicago By-Product Coke Co.	M	105	do	1921–22
	Granite City	St. Louis Gas & Coke Corp.	F	80	Roberts	1921
	Joliet	Illinois Steel Co.	F	280	Koppers	1908–9
	Lockport	Coal Products Manufacturing Co.	M	17	Wilputte	1912
	do	do	M	36	Koppers	1912
	South Chicago	By-Products Coke Corp.	M	120	Semet-Solvay	1905–1915
	do	do	M	110	Koppers	1925
	do	Wisconsin Steel Co.	F	88	Wilputte	1919
	Waukegan	North Shore Gas Co.	M	13	Semet-Solvay	1912
Indiana	Fort Wayne	Northern Indiana Gas & Elec. Co.	M	19	Koppers	1925
	Gary	Illinois Steel Co.	F	838	do	1911–1926
	Indiana Harbor.	Inland Steel Co.	F	204	do	1913–1926
	do	Youngstown Sheet & Tube Co.	F	120	Semet-Solvay	1919
	Indianapolis	Citizens Gas Co.	M	41	do	1913
	do	do	M	80	Wilputte	1918–1927
	Muncie	Central Indiana Gas Co.	M	22	Klönne	1912
	Terre Haute	Indiana Consumers Gas and By-Products Co.	M	60	Koppers	1919–1926
Kentucky	Ashland	Ashland By-Product Coke Co.	(3)	(3)	(3)	(3)
Maryland	Sparrows Point	Bethlehem Steel Co.	F	360	Koppers	1914–1927
Massachusetts	Everett	New England Fuel & Transportation Co.	M	400	United-Otto	1899
	do	do	M	55	Wilputte	1926
	Framingham	West Boston Gas Co.	M	15	Koppers	1927
	Lynn	Lynn Gas & Elec. Co.	M	11	do	1925
Michigan	Battle Creek	Battle Creek Gas Co.	M	18	do	1924–1927
	Detroit	Semet-Solvay Co.	M	(3)	(3)	(3)
	Flint	Consumers Power Co.	M	29	Koppers	1927
	Fordson	Ford Motor Co.	F	120	Semet-Solvay	1919
	do	do	F	120	Wilputte	1927
	Wyandotte	Michigan Alkali Co.	M	39	Koppers	1927
	Zilwaukee	Consumers Power Co.	M	19	do	1924
Minnesota	Duluth	Minnesota Steel Co.	F	90	do	1915–16
	St. Paul	Minnesota By-Product Coke Co.	M	60	do	1918
	West Duluth	Zenith Furnace Co.	F	65	United-Otto	1904–1916
Missouri	St. Louis	Laclede Gas Light Co.	M	56	Koppers	1915
	do	do	M	8	Piette	1921
New Jersey	Camden	Camden Coke Co.	M	37	Koppers	1921
	Kearny	Seaboard By-Product Coke Co.	M	170	do	1917–1925
New York	Buffalo	Donner-Hanna Coke Corp.	F	150	do	1920
	do	Semet-Solvay Co.	(3)	(3)	(3)	(3)
	Geneva	Empire Gas & Electric Co.	M	46	Semet-Solvay	1904–1909
	Hunts Point	Consolidated Gas Co.	M	74	Koppers	1926
	Lackawanna	Bethlehem Steel Co.	F	60	Semet-Solvay	1920
	do	do	F	171	Koppers	1924–1927
	Rochester	Rochester Gas & Electric Co.	M	60	do	1926
	Troy	Hudson Valley Coke & Products Corp.	F	55	American	1925
	Utica	Utica Gas & Electric Co.	M	42	Koppers	1924–1926
Ohio	Canton	Central Alloy Steel Corp.	F	47	do	1916
	Cleveland	American Steel & Wire Co.	F	180	do	1918
	do	Corrigan-McKinney Steel Co.	F	204	do	1916
	do	Otis Steel Co.	F	100	Semet-Solvay	1910–1913
	Dover	Hanna Furnace Co.	F	24	Roberts	1916
	East Youngstown.	Youngstown Sheet & Tube Co.	F	306	Koppers	1916–1918
	Ironton	Ironton By-Product Coke Co.	(3)	(3)	(3)	(3)
	Lorain	National Tube Co.	F	208	Koppers	1918
	Massillon	Central Alloy Steel Corp.	F	49	do	1927
	Painesville	Diamond Alkali Co.	M	46	do	1924–1927
	Portsmouth	Portsmouth By-Product Coke Co.	F	108	Semet-Solvay	1917
	Toledo	Toledo Furnace Co.	F	94	Koppers	1916
	Warren	Trumbull-Cliffs Furnace Co.	F	64	do	1924–1927
	Youngstown	Republic Iron & Steel Co.	F	204	do	1914–1926
	do	Youngstown Sheet & Tube Co.	F	84	do	1917

[3] Not at liberty to publish.

TABLE 20.—*By-product coke plants in the United States, December 31, 1927*—Con.

State	Town	Name of company operating plant	Type of plant	Number of ovens	Type of oven	Year put in operation
Pennsylvania	Bethlehem	Bethlehem Steel Co	F	424	Koppers	1918
	Chester	Philadelphia Suburban Gas & Electric Co.	M	25	Morrissey	1925
	Clairton	Carnegie Steel Co	F	1,482	Koppers	1918–1927
	Dunbar	Semet-Solvay Co	(3)	(3)	(3)	(3)
	Erie	Perry Iron Co	F	37	Wilputte	1925
	Johnstown	Bethlehem Steel Co	F	127	Koppers	1915–1927
	do	do	F	224	Cambria	1906–1920
	do	do	F	88	Semet-Solvay	1921
	Lebanon	do	F	90	do	1904–1921
	Midland	Pittsburgh Crucible Steel Co.	F	100	Koppers	1920
	Pittsburgh	Jones & Laughlin Steel Co.	F	300	do	1919–20
	do	do	F	60	Wilputte	1926
	Steelton	Bethlehem Steel Co	F	120	Semet-Solvay	1907
	do	do	F	60	Koppers	1919
	Swedeland	Rainey-Wood Coke Co	F	110	do	1919
	Woodlawn	Jones & Laughlin Steel Co.	F	122	do	1926
Rhode Island	Providence	Providence Gas Co	M	40	do	1919
Tennessee	Altonpark	Tennessee Products Corp	M	24	Semet-Solvay	1915
Utah	Provo	Columbia Steel Corp	F	33	Koppers	1924
Washington	Seattle	Seattle Lighting Co	M	20	Klönne	1914
West Virginia	Benwood	Semet-Solvay Co	(3)	(3)	(3)	(3)
	Fairmont	Domestic Coke Corp	M	60	Koppers	1920
	Follansbee	Wheeling Steel Corp	F	145	do	1917–1926
	Weirton	Weirton Steel Co	F	86	do	1923–1926
Wisconsin	Mayville	Youngstown Sheet & Tube Co.	F	108	Otto-Hoffman	1914–1917
	Milwaukee	Milwaukee Coke & Gas Co.	M	80	Semet-Solvay	1901–1906
	do	do	M	100	Koppers	1921–22

[3] Not at liberty to publish.

TABLE 21.—*By-product ovens under construction in the United States, December 31, 1927*

State	Town	Name of company operating plant	Number of ovens	Type of oven	Date of operation
Alabama	Fairfield	Tennessee Coal, Iron & R. R. Co.	63	Koppers	February, 1928.
Connecticut	New Haven	Connecticut Coke Co	61	do	September, 1928.
Illinois	South Chicago	Youngstown Sheet & Tube Co	70	do	October, 1928.
	Waukegan	North Shore Coke & Chemical Co.	31	do	June, 1928.
Minnesota	West Duluth	Zenith Furnace Co	41	do	November, 1928.
Utah	Provo	Columbia Steel Corporation	23	do	January, 1928.

TABLE 22.—*By-product ovens of each type at the end of the year, by States, in 1927*

State	Koppers [1]	Semet-Solvay [2]	United Otto [3]	Wilputte	Cambria-Belgian	Roberts [4]	American	Klönne	Piette	Total
Alabama	845	420		60						1,325
Colorado	120									120
Illinois	531	133		105		80				849
Indiana	1,121	161		80				22		1,384
Maryland	360									360
Massachusetts	26		400	55						481
Michigan	105	336		120						561
Minnesota	150		65							215
New Jersey	207									207
New York	497	226					55			778
Ohio	1,486	268				24				1,778
Pennsylvania	2,725	358		97	224	25				3,429
Tennessee		24								24
Utah	33									33
Washington								20		20
West Virginia	291	120								411
Kentucky, Missouri, Rhode Island, and Wisconsin	196	188	108						8	500
	8,693	2,234	573	517	224	129	55	42	8	12,475

[1] Includes the Koppers-Becker type.

[2] For certain plants the information in this column is derived from Iron Age, Jan. 26, 1928, p. 268.

[3] Includes the Otto-Hoffman and Schniewind types.

[4] Includes the Roberts-Morrissey type.

CAPACITY OF BY-PRODUCT OVENS

The capacity of existing plants is affected not only by the growth in number of ovens but by the increased capacity of the individual ovens. In contrast with the 21-inch ovens used in the pioneer days of the art present-day ovens in the United States have been narrowed to 18, 16, or 14 inches, with a more than proportionate reduction in coking time and therefore in fixed charges per ton. At the same time, by increasing the height and length, the capacity per oven has been raised from 6 or 8 tons to 10 or 12 tons. Larger unit charges and shorter coking time have together increased the daily output of coke per oven from 6 tons to 15 or even 18 tons. The ovens built since the World War (that is, from 1919 to 1927) have the average dimensions and capacities shown in Table 23.

Included among the group of "other merchant plants" are a number of installations of ovens, much below the average in dimensions and capacity, which have been made by city gas companies. A battery of 11 ovens installed in one northern city of 38,000 population has the following unit dimensions and capacity: Length, 23.7 feet; height, 10.8 feet; width, 13.5 inches; coke capacity per charge, 4.4 tons; coking time, 12 hours; and coke capacity per 24-hour day, 8.8 tons. In a number of the plants the rate of coking averages 1.1 or 1.2 inches per hour.

TABLE 23.—*Average dimensions and capacities of by-product coke ovens completed since the World War (1919–1927)*

	Blast-furnace plants	Alkali works	Other merchant plants	Total
Number of ovens built	3,439	85	975	4,499
Length ……feet	39.4	40.9	35.2	39.0
Height ……do	11.5	11.7	11.8	11.6
Width ……inches	16.6	15.8	15.2	16.5
Oven capacity per charge:				
Coal ……net tons	14.3	16.0	11.7	13.7
Coke ……do	10.1	12.0	8.4	9.7
Coking time ……hours	15.9	20.0	13.9	15.6
Coke capacity per 24-hour day ……net tons	15.2	14.4	14.5	15.0

TABLE 24.—*Estimated annual potential production of coke and coal required for charge of by-product coke ovens in the United States, 1925–1927, when operated at different percentages of maximum capacity, in millions of net tons*

Percentage of maximum capacity	1925				1926				1927			
	Ovens completed Dec. 31		Including ovens under construction		Ovens completed Dec. 31		Including ovens under construction		Ovens completed Dec. 31		Including ovens under construction	
	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]
100	48.2	68.8	50.7	72.4	52.7	75.3	58.7	83.9	57.9	82.7	59.5	85.0
90	43.4	61.9	45.6	65.2	47.4	67.8	52.8	75.5	52.1	74.4	53.6	76.5
85	41.0	58.5	43.1	61.5	44.8	64.0	49.9	71.3	49.2	70.3	50.6	72.3
75	36.2	51.6	38.0	54.3	39.5	56.5	44.0	62.9	43.4	62.0	44.6	63.8
50	24.1	34.4	25.4	36.2	26.4	37.7	29.4	42.0	29.0	41.4	29.8	42.5

[1] Coal for charge estimated on basis of 70 per cent yield in coke.

TABLE 25.—*Relation (per cent) of production to maximum capacity at by-product coke plants, 1922–1927, by months*

	1922	1923	1924	1925	1926	1927
January	50.4	83.2	81.4	86.0	94.6	84.5
February	53.4	85.0	83.8	86.0	96.4	85.4
March	57.4	87.2	84.8	85.7	93.8	87.2
April	59.2	88.7	81.4	84.9	89.5	84.8
May	68.1	89.1	73.1	80.9	89.0	83.9
June	69.2	87.6	65.3	80.3	88.4	82.3
July	66.7	87.2	59.2	78.0	89.3	79.3
August	48.2	86.5	61.1	77.8	88.3	79.8
September	62.3	85.9	65.7	80.9	88.7	80.8
October	75.4	82.8	71.7	82.0	88.5	76.4
November	81.2	81.1	74.8	88.5	88.9	74.2
December	82.2	80.1	80.8	90.6	84.7	74.6
The year	64.6	85.4	73.4	83.5	89.9	80.9

QUANTITY AND COST OF COAL CHARGED

Although the quantity of coal used in the manufacture of coke has been increasing at a rapid rate during the past 30 years (Coke and By-products in 1925, p. 558), the proportion carbonized of the total output of bituminous coal each year has remained remarkably constant, ranging from 12 to about 15 per cent. The only year that showed marked digression from this general trend was 1921, when the country was in the grip of a profound business depression that dealt especially severely with the heavy industries, the principal consumers of coke. In 1927 the coke ovens in the United States used 74,447,888 tons, 14.4 per cent of the total output of bituminous coal (Table 26). Of this amount 63,239,773 tons, or 85 per cent, was used in the by-product ovens.

Table 27 shows the quantity of coal charged into ovens in each State and the value at the ovens. The cost of coal constitutes the chief item of expense in the manufacture of coke. In 1927 the cost per ton of raw coal f. o. b. ovens ranged from $1.56 in West Virginia, where beehive coke is made at the mines, to $5.48 in Minnesota, where the cost includes heavy freight charges from distant mines.

The average cost of coal used in beehive ovens in 1927 amounted to $2.08 a ton, and the cost of the coal equivalent of 1 ton of merchantable coke was $3.24.

At the by-product ovens in 1927 the average cost per ton of the coal charged was $3.87, a slight decrease from the preceding year and considerably less than in most other years since the World War. It should be remembered, however, that the cost of coal used by the by-product ovens as given in these tables does not necessarily represent the market value of the coal. Many of the by-product operators mine their own coal, and the reported cost is often a bookkeeping value. Still other companies are covered by long-term contracts and are not affected by market flurries. Thus, if the cost of coal to by-product producers represented the prices that coal of similar quality would command on the open market the figures for 1927 would show a marked increase over those for the previous year. Conversely, those for 1924, for example, would be considerably lower than the costs actually reported for that year as shown in Table 28.

TABLE 26.—*Coal used in manufacture of coke in the United States, 1918–1927, in net tons*

[For comparable figures back to 1880 see Coke and By-products in 1925, p. 558]

Year	By-product	Beehive	Total
1918	36,867,721	48,160,297	85,028,018
1919	35,857,419	29,730,499	65,587,918
1920	44,204,996	31,985,836	76,190,832
1921	28,713,111	8,475,446	37,188,557
1922	41,052,670	13,285,868	54,338,538
1923	54,275,577	30,084,366	84,359,943
1924	49,061,339	15,914,310	64,975,649
1925	57,109,651	17,422,581	74,532,232
1926	63,646,610	19,224,500	82,871,110
1927	63,239,773	11,208,115	74,447,888

TABLE 27.—*Total quantity and value at ovens of coal used in the manufacture of coke, by States, 1926–27*

State	Coal used (net tons)	Cost of coal		Coal per ton of coke	
		Total	Per ton of coal	Net tons	Cost
1926					
By-product plants:					
Alabama	6, 799, 773	$18, 028, 394	$2. 65	1. 42	$3. 76
Colorado	859, 725	(1)	(1)	1. 45	------
Illinois	4, 712, 342	22, 383, 678	4. 75	1. 41	6. 70
Indiana	7, 994, 696	39, 996, 809	5. 00	1. 33	6. 65
Maryland	1, 534, 021	(1)	(1)	1. 37	------
Massachusetts	874, 053	(1)	(1)	1. 52	------
Michigan	2, 522, 841	11, 987, 259	4. 75	1. 38	6. 56
Minnesota	903, 041	4, 811, 540	5. 33	1. 46	7. 78
New Jersey	1, 260, 372	(1)	(1)	1. 38	------
New York	3, 950, 026	18, 179, 261	4. 60	1. 40	6. 44
Ohio	10, 962, 723	42, 337, 226	3. 86	1. 45	5. 60
Pennsylvania	16, 895, 070	50, 241, 119	2. 97	1. 51	4. 48
Tennessee	165, 065	498, 078	3. 02	1. 39	4. 20
Utah	326, 544	(1)	(1)	1. 77	------
Washington	67, 544	359, 085	5. 32	1. 59	8. 46
West Virginia	1, 632, 790	5, 011, 548	3. 07	1. 45	4. 45
Kentucky, Missouri, Rhode Island, and Wisconsin	2, 185, 984	8, 882, 545	4. 06	1. 39	5. 64
Undistributed	------------	24, 453, 742	5. 04	--------	------
	63, 646, 610	247, 170, 284	3. 88	1. 43	5. 55
Beehive plants:					
Colorado	307, 011	(1)	(1)	1. 56	------
Georgia	5, 125	17, 795	3. 47	1. 68	5. 83
Kentucky	249, 952	400, 156	1. 60	1. 69	2. 70
Ohio	125, 883	(1)	(1)	1. 48	------
Pennsylvania	16, 344, 439	32, 266, 831	1. 97	1. 52	2. 99
Tennessee	215, 647	481, 696	2. 23	1. 76	3. 92
Utah	203, 750	679, 229	3. 33	1. 68	5. 59
Virginia	599, 943	1, 176, 047	1. 96	1. 62	3. 18
Washington	39, 265	171, 588	4. 37	1. 59	6. 95
West Virginia	957, 029	1, 632, 858	1. 71	1. 64	2. 80
Alabama and New Mexico	176, 456	393, 414	2. 23	1. 59	3. 55
Undistributed	------------	1, 322, 077	3. 05	--------	------
	19, 224, 500	38, 541, 691	2. 00	1. 54	3. 08
1927					
By-product plants:					
Alabama	6, 203, 290	16, 363, 237	2. 64	1. 42	3. 75
Colorado	867, 792	(1)	(1)	1. 46	------
Illinois	4, 367, 337	20, 404, 573	4. 67	1. 45	6. 77
Indiana	7, 448, 393	37, 612, 644	5. 05	1. 34	6. 77
Maryland	1, 476, 742	(1)	(1)	1. 37	------
Massachusetts	1, 092, 900	5, 377, 136	4. 92	1. 47	7. 23
Michigan	2, 693, 576	12, 666, 987	4. 70	1. 40	6. 58
Minnesota	919, 801	5, 044, 602	5. 48	1. 45	7. 95
New Jersey	1, 244, 627	(1)	(1)	1. 37	------
New York	5, 114, 280	24, 103, 032	4. 71	1. 42	6. 69
Ohio	10, 470, 533	40, 589, 989	3. 88	1. 45	5. 63
Pennsylvania	16, 690, 980	49, 299, 291	2. 95	1. 51	4. 45
Tennessee	162, 372	537, 490	3. 31	1. 33	4. 40
Utah	318, 367	(1)	(1)	1. 61	------
Washington	64, 926	338, 429	5. 21	1. 60	8. 34
West Virginia	2, 065, 812	5, 860, 630	2. 84	1. 48	4. 20
Kentucky, Missouri, Rhode Island, and Wisconsin	2, 038, 045	8, 660, 231	4. 25	1. 41	5. 99
Undistributed	------------	17, 815, 855	4. 56	--------	------
	63, 239, 773	244, 674, 126	3. 87	1. 44	5. 57
Beehive plants:					
Colorado	299, 559	(1)	(1)	1. 54	------
Pennsylvania	8, 729, 862	17, 544, 410	2. 01	1. 53	3. 08
Tennessee	185, 829	428, 748	2. 31	1. 77	4. 09
Utah	142, 053	(1)	(1)	1. 67	------
Virginia	528, 032	1, 048, 519	1. 99	1. 67	3. 32
Washington	47, 953	213, 391	4. 45	1. 56	6. 94
West Virginia	898, 043	1, 405, 206	1. 56	1. 70	2. 65
Georgia, Kentucky, and Ohio	376, 784	1, 178, 834	3. 13	1. 62	5. 07
Undistributed	------------	1, 442, 519	3. 27	--------	------
	11, 208, 115	23, 261, 627	2. 08	1. 56	3. 24

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[1] Included under "Undistributed."

TABLE 28.—*Average cost per net ton of coal charged into by-product coke ovens, by States, 1918–1927*

State	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Alabama	$3.29	$3.35	$4.10	$3.29	$2.47	$2.95	$2.85	$2.68	$2.65	$2.64
Illinois	4.63	4.73	6.49	5.90	5.92	5.78	5.16	4.89	4.75	4.67
Indiana	4.50	4.63	5.92	5.89	5.70	5.77	5.23	5.03	5.00	5.05
Kentucky	3.34	3.40	4.84	4.20	4.28	(1)	(1)	(1)	(1)	(1)
Massachusetts	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	4.92
Michigan	4.51	4.60	7.03	5.77	5.65	5.79	5.34	4.76	4.75	4.70
Minnesota	5.31	4.33	6.50	7.12	6.79	6.74	5.89	5.33	5.33	5.48
New York	4.46	4.34	6.20	5.86	5.60	5.31	4.75	4.51	4.60	4.71
Ohio	3.98	3.85	5.75	4.94	5.04	4.84	4.04	3.82	3.86	3.88
Pennsylvania	3.74	2.99	3.91	3.39	3.78	3.77	3.19	2.97	2.97	2.95
Tennessee	3.59	3.64	4.30	3.84	3.84	3.50	3.33	3.00	3.02	3.31
Washington	5.72	5.89	6.63	6.53	5.50	5.44	5.39	5.32	5.32	5.21
West Virginia	3.57	3.18	4.82	3.89	4.07	4.03	3.82	3.06	3.07	2.84
Average	4.23	3.96	5.40	4.84	4.73	4.76	4.13	3.86	3.88	3.87
Cost of coal per ton of coke	6.00	5.65	7.73	7.03	6.81	6.85	5.95	5.52	5.55	5.57

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(1) Not at liberty to publish.

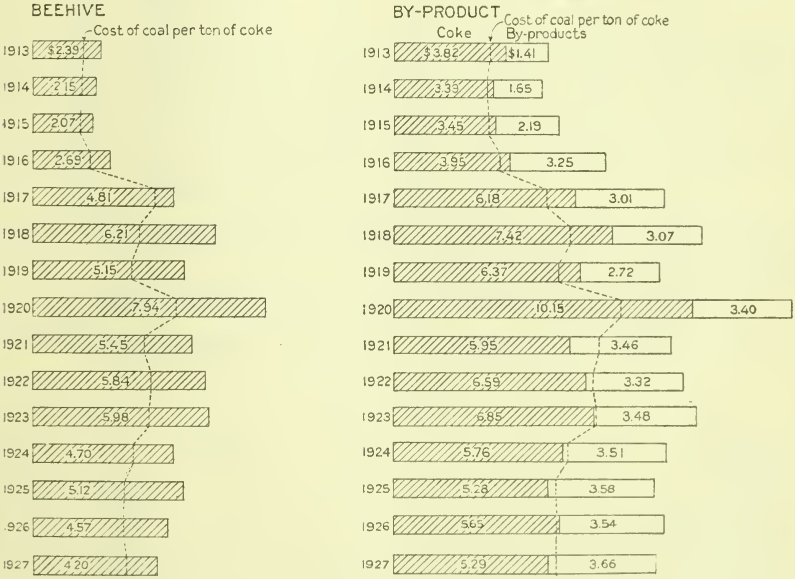

FIGURE 21.—Cost of coal and value of all products per ton of coke produced, 1913–1927

Figure 21 traces the relative values of the coke and the by-products and the cost of coking coal, all reckoned per ton of coke produced. Thus, in 1913 the average value of coke was $3.83, the value of the by-products per ton of coke was $1.41, and the cost of coal per ton of coke was $3.27. In 1927 the value of the coke had risen to $5.29 per ton and the value of the by-products per ton of coke to $3.66; and the cost of coal per ton of coke was $5.57. These figures, of course, represent merely the gross value of the products and a single item of cost; they take no account of the other costs of manufacture, such as wages, salaries, purchased electric power, insurance, taxes, and fixed charges on a very large investment. No data on total cost and therefore on profits have been collected, but the diagrams indicate clearly the trends of the market. Particularly important to the coke producers were the shifts in the values of the several by-products. (Fig. 27.) Increases in the value of tar and gas have more than offset a decline in the value of the benzols and ammonia, and the gross value of all the by-products reckoned per ton of coke is now much higher than before the war.

TABLE 29.—*Cost of coal and value of all products per net ton of coke produced, 1913–1927*

[All figures reduced to value per net ton of coke produced]

Year	By-product coke					Beehive coke		
	Value of coke per ton [1]	Per ton of coke				Value of coke per ton [1]	Per ton of coke	
		Value of all by-products	Total value of products	Cost of coal	Excess, products over coal		Cost of coal	Excess, coke over coal
1913	$3.83	$1.41	$5.24	$3.27	$1.97	$2.39	$1.75	$0.64
1914	3.39	1.65	5.04	3.19	1.85	2.15	1.67	.48
1915	3.45	2.19	5.64	3.24	2.40	2.07	1.61	.46
1916	3.95	3.25	7.20	3.62	3.58	2.69	1.96	.73
1917	6.18	3.01	9.19	5.20	3.99	4.81	3.17	1.64
1918	7.42	3.07	10.49	6.00	4.49	6.21	3.65	2.56
1919	6.37	2.72	9.09	5.65	3.44	5.15	3.39	1.76
1920	10.15	3.40	13.55	7.73	5.82	7.94	4.90	3.04
1921	5.95	3.46	9.41	7.03	2.38	5.45	3.82	1.63
1922	6.59	3.32	9.91	6.81	3.10	5.84	4.05	1.79
1923	6.85	3.48	10.33	6.85	3.48	5.98	3.97	2.01
1924	5.76	3.51	9.27	5.95	3.32	4.70	3.44	1.26
1925	5.28	3.58	8.86	5.52	3.34	4.56	3.14	1.42
1926	5.65	3.52	9.17	5.55	3.62	4.57	3.08	1.49
1927	5.29	3.66	8.95	5.57	3.38	4.20	3.24	.96

[1] Includes operators' statements of the value of coke consumed by them in associated enterprises but not sold, except that in 1918 and 1920 the value of such coke was estimated for each State at the average value for that State of the part of the product reported sold.

PREPARATION AND SOURCE OF COAL CHARGED

TABLE 30.—*Washed and unwashed coal used in the manufacture of by-product and beehive coke, by States in which used, in 1927, in net tons*

State	Washed	Unwashed	Total
By-product ovens:			
Alabama	[1] 6,203,290	(1)	6,203,290
Colorado	867,792		867,792
Illinois		4,367,337	4,367,337
Indiana		7,448,393	7,448,393
Maryland		1,476,742	1,476,742
Massachusetts		1,092,900	1,092,900
Michigan	(2)	[2] 2,693,576	2,693,576
Minnesota		919,801	919,801
New Jersey		1,244,627	1,244,627
New York	(2)	[2] 5,114,280	5,114,280
Ohio		10,470,533	10,470,533
Pennsylvania	1,568,044	15,122,936	16,690,980
Tennessee	162,372		162,372
Utah		318,367	318,367
Washington	64,926		64,926
West Virginia		2,065,812	2,065,812
Kentucky, Missouri, Rhode Island, and Wisconsin		2,038,045	2,038,045
	[1][2] 8,866,424	[1][2] 54,373,349	63,239,773
Beehive ovens:			
Colorado	[1] 299,559	(1)	299,559
Pennsylvania	848,799	7,881,063	8,729,862
Tennessee	185,829		185,829
Utah		142,053	142,053
Virginia		528,032	528,032
Washington	47,953		47,953
West Virginia	121,526	776,517	898,043
Georgia, Kentucky, and Ohio		376,784	376,784
	[1] 1,503,666	[1] 9,704,449	11,208,115

[1] A small amount of unwashed coal, which can not be shown separately, is included with the washed.
[2] A small amount of washed coal, which can not be shown separately, is included with the unwashed.

WASHED AND UNWASHED COAL

In Alabama, Colorado, Tennessee, Washington, and certain parts of Pennsylvania and West Virginia the coal used is washed before it is charged in the ovens. For the country as a whole in 1927, 14 per cent of the coal used in by-product ovens and 13.4 per cent of that in beehive ovens was washed (Table 30). The washing is done sometimes by the coal producer at the mine and sometimes by the coke producer at the plant.

SOURCE OF BY-PRODUCT COAL IN 1927

Because of the wide interest in the supplies of coal suitable for the manufacture of by-product coke the bureau asks each operator for a statement of the source of the coal charged during the year. In Table 31 the quantities reported are grouped by field of origin in as great detail as the nature of the replies permits. Considerable tonnages were so reported that they could not be accurately separated by fields, and it is hoped that in future the analysis can be made more detailed and exact.

The Appalachian fields remain the great source of by-product coal, but it is interesting to note that 437,000 tons was drawn from southern Illinois, 172,000 tons from western Kentucky, 7,800 tons from Indiana, 986,000 tons from the Trinidad field of Colorado, 324,000 from Carbon County, Utah, and 65,000 from Pierce County, Wash.

Table 32 analyzes the distribution of by-product coking coal from State where produced to State where used.

TABLE 31.—*Coal used in the manufacture of by-product coke in 1927, by field of origin, in net tons*

[Based upon detailed reports from each coke plant. The difference between these totals and those shown in Tables 2, etc., is due to change in stock, loss of weight in handling, and to the fact that these sometimes represent purchases during the year rather than actual consumption]

State and district where coal was produced	Total used	States where coal was consumed—in order of importance
Alabama	6,572,347	Alabama.
Colorado: Trinidad	986,389	Colorado.
Georgia: Durham	46,286	Tennessee.
Illinois: Southern	437,030	Illinois.
Indiana	7,812	Do.
Kentucky:		
Western Kentucky	172,491	Do.
Eastern Kentucky—		
Elkhorn	2,640,253	Michigan, Indiana, Ohio, Kentucky, New York, Minnesota, Wisconsin, and Illinois.
Harlan, Pond Creek, and Alma	4,793,299	Indiana, Illinois, Michigan, Ohio, and Wisconsin.
Southern Appalachian	[1] 41,000	Wisconsin and Illinois.
Unspecified	1,718,777	Ohio, Indiana, New York, Minnesota, Illinois, and Massachusetts.
Maryland: Georges Creek	[1] 2,000	Pennsylvania.
Ohio: Steubenville	1,012	West Virginia.
Pennsylvania:		
Connellsville	15,376,576	Pennsylvania, Ohio, New York, West Virginia, Minnesota, and Indiana.
Pittsburgh	4,995,690	Pennsylvania, New York, West Virginia, Ohio, Minnesota, and Illinois.
Pittsburgh and Westmoreland, unspecified.	3,416,998	Pennsylvania, New York, and Maryland.
Westmoreland	252,286	New York, Massachusetts, Rhode Island, and Illinois.
Freeport	1,028,740	West Virginia, Indiana, Michigan, and Pennsylvania.
Central Pennsylvania, high volatile.	174,597	New York.
Central Pennsylvania, low volatile	1,941,750	Pennsylvania, New York, and Maryland.
Somerset	158,543	Pennsylvania.
Broad Top	[1] 28,000	Do.
Unspecified	387,954	New Jersey and New York.
Tennessee	108,361	Tennessee.
Utah: Carbon County	323,655	Utah.
Virginia: Wise, Lee, and Dickenson Counties.[2]	1,342,896	New Jersey, New York, Massachusetts, Missouri, Tennessee, and Illinois.

[1] Partly estimated.

[2] Coal from the extension of the Pocahontas field in Tazewell County, Va., is included under West Virginia (Pocahontas).

TABLE 31.—*Coal used in the manufacture of by-product coke in 1927, by field of origin, in net tons*—Continued

State and district where coal was produced	Total used	States where coal was consumed—in order of importance
Washington: Pierce County	64,926	Washington.
West Virginia:		
Northern	2,953,610	Pennsylvania, Maryland, Massachusetts, West Virginia, New Jersey, and New York.
Kanawha and Logan	4,074,545	Indiana, Illinois, Ohio, Michigan, Wisconsin, Rhode Island, New Jersey, and New York.
Pocahontas [2]	8,060,317	Indiana, Ohio, Illinois, Michigan, New York, Minnesota, Massachusetts, Pennsylvania, West Virginia, and Wisconsin.
New River and Winding Gulf	1,655,660	New Jersey, Wisconsin, Indiana, Ohio, Illinois, New York, Missouri, Kentucky, and Rhode Island.
Pocahontas and New River, unspecified.	665,225	Ohio, West Virginia, and Minnesota.
Thacker	[1] 25,000	Wisconsin and Illinois.
State not reported	6,038	Missouri and Minnesota.
	64,460,063	

[1] Partly estimated.

[2] Coal from the extension of the Pocahontas field in Tazewell County, Va., is included under West Virginia (Pocahontas).

TABLE 32.—*Coal used in the manufacture of by-product coke in 1927, by State where produced and State where consumed, in net tons*

State where coal was used	Coal produced in—							
	Alabama	Colorado	Georgia	Illinois	Indiana	Kentucky	Maryland	Ohio
Alabama	6,572,347							
Colorado		986,389						
Illinois				437,030	7,812	1,725,535		
Indiana						2,144,779		
Massachusetts						[1] 40,000		
Michigan						(2)		
Minnesota						360,846		
New York						(2)		
Ohio						2,430,587		
Pennsylvania							[1] 2,000	
Tennessee			46,286					
West Virginia								1,012
Kentucky, Missouri, Rhode Island, and Wisconsin						(2)		
Undistributed						2,664,073		
	6,572,347	986,389	46,286	437,030	7,812	9,365,820	[1] 2,000	1,012

State where coal was used	Coal produced in—							
	Pennsylvania	Tennessee	Utah	Virginia [3]	Washington	West Virginia [3]	Miscellaneous	Total [4]
Alabama								6,572,349
Colorado								986,387
Illinois	15,623			7,812		2,247,877		4,441,689
Indiana	380,650					4,922,965		7,448,394
Maryland	560,697					916,045		1,476,742
Massachusetts	47,342			(2)		(2)		1,099,736
Michigan	(2)					1,485,103		3,199,990
Minnesota	245,938					312,552	465	919,801
New Jersey	21,954			511,017		730,739		1,263,710
New York	3,770,106			(2)		653,909		5,145,854
Ohio	5,441,504					2,609,132		10,481,223
Pennsylvania	15,554,222					1,139,003		16,695,225
Tennessee		108,361		26,511				181,158
Utah			323,655					323,655
Washington					64,926			64,926
West Virginia	1,512,002					552,762		2,065,776
Kentucky, Missouri, Rhode Island, and Wisconsin	(2)			(2)		(2)	5,573	2,093,448
Undistributed	211,096			797,556		1,864,270		
	27,761,134	108,361	323,655	1,342,896	64,926	17,434,357	6,038	64,460,063

[1] Partly estimated.

[2] Included under "Undistributed."

[3] Coal from the extension of the Pocahontas field in Tazewell County, Va., is included under West Virginia.

[4] Difference between these totals and those shown in Tables 2, etc., is due to change in stock, loss of weight in handling, and to the fact that these sometimes represent purchases made during the year rather than actual consumption.

SHIFTS IN SOURCES OF COKING COAL IN LAST DECADE

The replacement of beehive by by-product ovens has brought about a change in the sources of coking coal. (Illustrated in fig. 22.) This diagram compares 1916 and 1926, both years of activity in the iron and steel industry. The total quantity of coal charged in coke ovens in 1926 was 82,900,000 tons, as against 81,600,000 in 1916. But although consumption in the industry as a whole was thus a little larger in 1926, the quantity drawn from Pennsylvania was much less and that drawn from West Virginia and especially from Kentucky was much greater. In 1916 a total of 49.8 million tons of coal mined in Pennsylvania was charged in coke ovens; the corresponding figure for 1926 was 43.3 million tons, a decrease of 6.5 million tons in the 10 years. There was, indeed, an increase in the tonnage of Pennsylvania coal used in by-product ovens (shown by the black segments in the diagram), but it was offset by a great decrease in the tonnage used in beehive ovens. At the same time the quantity of West Virginia coal used increased from 15.1 million tons in 1916 to 18.0 million in 1926. The largest increase was experienced by the coals of Kentucky, the consumption of which rose from 3.3 to 10.2 million. This shift in the sources of coking coal, it should be remembered, was largely influenced by differentials in freight rates and differences in wage rates in the northern and southern fields.

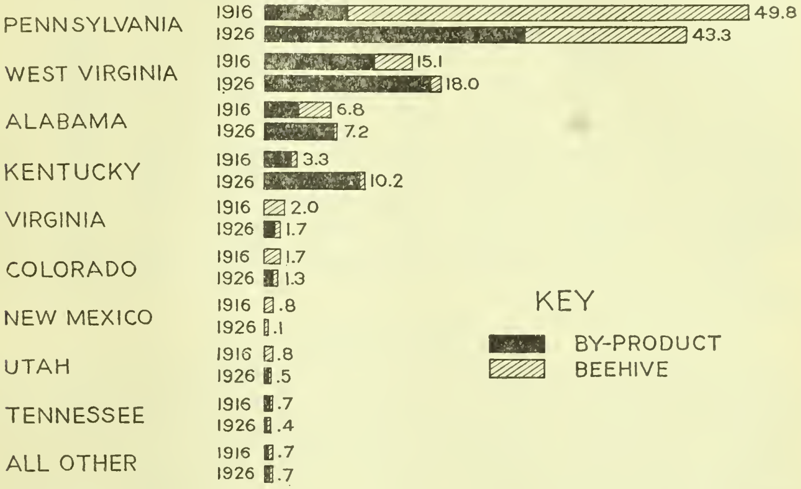

FIGURE 22.—Changes in the sources of coal consumed in by-product and beehive coke ovens, 1916 and 1926. Figures represent million net tons

YIELD OF COKE PER TON OF COAL

TABLE 33.—*Percentage yield of coke from coal in by-product and beehive ovens, by States, 1924–1927*

State	1924		1925		1926		1927	
	By-product	Beehive	By-product	Beehive	By-product	Beehive	By-product	Beehive
Alabama	68.8	60.4	70.3	64.4	70.3	(1)	70.4	---------
Colorado	69.3	64.2	69.3	64.8	69.0	64.2	68.5	64.8
Georgia	---------	56.1	---------	56.9	---------	59.7	---------	(1)
Illinois	69.3	---------	71.3	---------	70.8	---------	69.0	---------
Indiana	73.3	---------	74.9	---------	74.9	---------	74.5	---------
Kentucky	(1)	54.0	(1)	61.1	(1)	59.0	(1)	(1)
Maryland	73.4	---------	73.4	---------	73.1	---------	73.0	---------
Massachusetts	69.2	---------	67.1	---------	65.6	---------	68.1	---------
Michigan	73.5	---------	71.5	---------	72.4	---------	71.3	---------
Minnesota	69.1	---------	65.4	---------	68.6	---------	68.8	---------
New Jersey	72.3	---------	72.8	---------	72.5	---------	72.8	---------
New Mexico	---------	61.0	---------	61.4	---------	(1)	---------	---------
New York	70.7	---------	72.2	---------	71.6	---------	70.4	---------
Ohio	67.9	65.0	68.7	64.8	68.9	67.5	68.9	(1)
Pennsylvania	67.1	65.4	67.1	65.7	66.3	65.6	66.3	65.5
Tennessee	73.3	52.9	70.6	63.7	71.9	56.8	75.3	56.4
Utah	51.2	59.4	53.2	59.0	56.6	59.6	61.9	59.7
Virginia	---------	63.0	---------	63.8	---------	61.8	---------	60.0
Washington	56.2	64.3	59.3	61.5	63.0	62.9	62.5	64.0
West Virginia	67.3	61.7	69.2	60.9	69.2	61.0	67.6	58.7
Average	69.3	64.6	69.9	65.2	69.7	65.0	69.4	64.3

[1] Not at liberty to publish data.

COKE BREEZE

The manufacture of coke produces appreciable percentages of coke breeze or screenings too fine for metallurgical or household use. Logically this material, which probably averages somewhat more than 12,000 B. t. u. per pound on a dry basis, should be considered part of the coke production because of its value as a fuel. Inclusion of this material, however, would not conform to the general trade usage. Moreover, present and past production could not then be accurately compared, for statistical records of breeze produced before 1916 are fragmentary. Hence, breeze is treated in this report as a by-product, and the term "coke" refers only to the larger material from which the screenings have been removed. The size of the material classed as breeze varies with the different plants, but it may be described roughly as corresponding to the steam sizes of anthracite. Table 34 indicates that in the beehive branch of the industry the problem of finding a profitable outlet for breeze remains unsolved. The quantity reported as produced in 1927 was only 146,362 tons, a small part of the total quantity of fine material resulting from the carbonization of the coal charged during the year. Limited amounts of the breeze produced in beehive ovens are used by the producer for steam raising and other purposes, and even smaller quantities are sold.

Uses can ordinarily be found for the breeze produced at by-product coke plants, and the amount wasted is negligible. As the low value per ton will not justify long hauls, breeze is generally used at or near the producer's plant. Approximately 83 per cent of the breeze obtained at by-product plants in 1927 was consumed by the producer, generally as a boiler fuel, and 17 per cent was sold to near-by consumers. By-product breeze is also utilized frequently as a fuel for gas producers, especially when the surplus gas of the plant is sold for city use, the producer gas being employed to heat the ovens.

TABLE 34.—*Coke breeze recovered at coke plants, by States, in 1927*

State	Yield (per cent of coal)	Produced		Used for steam raising		Used for other purposes by producer		Sold		On hand Dec. 31 (net tons)	Wasted (net tons)
		Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value		
By-product ovens:											
Alabama	5.1	317,832	$448,024	196,269	$292,078	15,199	$30,705	63,632	$88,364	54,920	(1)
Colorado	4.6	39,894	(1)	36,049	(1)	3,845	(1)				
Illinois	5.9	258,698	668,393	173,531	429,215	(1)	(1)	93,996	265,258	96,585	
Indiana	5.2	387,173	974,574	314,723	732,957	30,851	53,876	46,767	200,219	13,073	
Maryland	6.5	95,452	(1)	55,609	(1)	27,767	(1)	30,513	(1)	33,650	
Massachusetts	5.8	63,635	186,729	13,986	(1)	7,137	24,580	42,495	(1)	4,788	
Michigan	6.1	163,055	468,755	97,700	246,498	3,305	15,832	40,679	132,569	40,770	
Minnesota	7.7	70,670	227,323	45,619	117,725	(1)	(1)	15,282	64,490	313	
New Jersey	3.6	44,837	(1)	44,266	(1)			644	(1)	606	
New York	5.1	259,919	674,933	195,227	459,698	30,347	130,058	15,853	36,092	31,752	11,639
Ohio	7.2	749,097	1,445,206	555,780	905,947	27,753	54,552	177,820	510,192	47,901	
Pennsylvania	8.1	1,346,809	2,489,540	954,986	1,605,040	316,230	587,357	135,475	405,094	18,898	(1)
Tennessee	4.5	7,271	17,087	5,628	13,242					3,610	
Utah	3.1	9,746	(1)					12,981	(1)	29,270	
Washington	5.7	3,706	3,706	3,638	3,638			68	68		
West Virginia	6.2	128,866	194,949	78,021	113,282	7,522	13,088	30,192	51,638	14,300	
Kentucky, Missouri, Rhode Island, and Wisconsin	7.5	153,042	444,575	135,217	284,524	(1)	(1)	9,840	22,857	8,539	
Undistributed			429,822		324,483	63,366	330,776		265,655		7,052
	6.5	4,099,702	8,673,616	2,906,249	5,528,327	533,322	1,240,824	716,237	2,042,496	398,975	18,691
Beehive ovens:											
Colorado and Utah	[2].98	2,325	13,318					2,325	13,318		
Ohio, Tennessee, and Virginia	[2]1.3	7,879	12,707	2,900	1,470			4,978	11,237	20	
Pennsylvania	[2]3.5	128,287	164,960	39,195	19,895	100	81	28,374	52,214	34,894	17,827
West Virginia	[2]3.3	7,871	8,278	5,211	2,606			2,600	5,590		60
	[2]3.1	146,362	199,263	47,306	23,971	100	81	38,277	82,359	34,914	[3]17,887

[1] Included under "Undistributed."

[2] Yield computed by dividing the production of breeze at the few plants reporting by the quantity of coal charged at those plants.

[3] As reported; quantity produced but not used was undoubtedly greater. See Mineral Resources, 1922, pt. 2, pp. 726–727.

FURNACE, FOUNDRY, AND OTHER COKE

SOURCE OF INFORMATION

Tables 35 to 38 analyze the replies of the producers to the following questions, which have been used with minor changes since 1923:

Disposal of coke (excluding breeze)	Net tons	Value at ovens
Used in blast furnaces or affiliated works (not sold)		
Sold for furnace use—		
To financially affiliated corporations		
To other merchant consumers		
Sold for foundry use		
Sold for other industrial use		
Sold for domestic use		

In considering these tables it should be remembered that the terms "furnace" and "foundry" coke are often used in the trade to designate physical or chemical properties of the coke as well as the use to which the product is put. (See Coke and By-products in 1922, pp. 729–730.) Not all beehive coke sold under the name of "foundry coke," for example, finds its way to foundrymen. Because of the way in which the question is phrased, however, it is believed that the replies of the operators here summarized give with reasonable accuracy the quantities sold for use in furnace, foundry, and other industrial operations, and for domestic purposes. The quantity "used by the producer not sold" is not subdivided according to use. The great bulk of this is known to be "furnace" coke used in iron blast furnaces, but the item also includes considerable tonnages used for steam generating or producer gas around the coke plant or associated steelworks, a certain amount used by western metal-mining companies for smelting the nonferrous metals, a small tonnage used in alkali manufactories associated with the coke plants, and a small, though increasing quantity, consumed to make producer gas or water gas at coke plants producing gas for city supply.

BY-PRODUCT COKE DISTRIBUTED IN 1927

In 1927 the producers of by-product coke reported sales of 12,590,544 tons, of which 2,959,247 tons was furnace coke sold to affiliated corporations, 967,277 tons furnace coke sold to nonaffiliated purchasers (merchant sales), 1,938,653 tons foundry coke, 2,022,838 tons coke destined for other industrial uses, including the manufacture of water gas, and 4,702,529 tons sold for domestic use. (Table 35.)

The quantity not sold but used by the producers themselves was 30,687,198 tons. Out of this approximately 500,000 tons was used in affiliated alkali works or consumed in gas producers or water-gas generators at plants supplying coke-oven gas for city distribution. The remainder was consumed in blast furnaces or for other uses connected with associated metallurgical works.

The total quantity distributed in 1927, including sales and the amount used by the producer, was slightly less than the total production, the difference being carried over in storage to the following year.

TABLE 35.—*By-product coke produced and sold or used by the producer, by States, in 1927*

[Exclusive of screenings and breeze]

State	Produced		Used by producer in blast furnace, etc.		Sold									
					Furnace		Foundry		Other industrial use (including water gas)		Domestic use		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Alabama	4, 364, 354	$13, 500, 234	3, 740, 137	$11, 113, 205	(1)	(1)	375, 964	$1, 983, 525	[1] 117, 195	[1] $536, 108	164, 462	$625, 498	657, 621	$3, 145, 131
Colorado	594, 402	(2)	582, 774	(2)	----------	----------	----------	----------	432	(2)	----------	----------	432	(2)
Illinois	3, 013, 940	21, 076, 519	1, 653, 043	10, 521, 403	(2)	(2)	(2)	(2)	348, 175	3, 141, 657	654, 463	4, 520, 736	1, 236, 140	9, 624, 378
Indiana	5, 549, 762	37, 152, 981	4, 871, 150	32, 430, 073	(1)	(1)	266, 866	2, 273, 905	[1] 21, 947	[1] 153, 173	344, 506	1, 982, 176	633, 319	4, 409, 254
Maryland	1, 077, 309	(2)	979, 490	(2)	----------	----------	----------	----------	101, 500	(2)	2, 350	(2)	103, 850	(2)
Massachusetts	744, 091	6, 008, 556	(2)	(2)	(2)	(2)	(2)	(2)	70, 802	(2)	233, 424	2, 016, 271	667, 596	5, 391, 969
Michigan	1, 920, 394	12, 227, 241	505, 326	2, 806, 493	----------	----------	(2)	(2)	(2)	(2)	968, 585	6, 488, 197	1, 425, 831	9, 504, 712
Minnesota	632, 628	6, 212, 501	281, 269	2, 641, 953	----------	----------	(2)	(2)	(2)	(2)	(2)	(2)	298, 029	3, 047, 843
New Jersey	906, 321	(2)	75, 016	(2)	44, 000	(2)	69, 677	(2)	359, 378	(2)	268, 457	(2)	741, 512	(2)
New York	3, 602, 642	24, 125, 451	1, 318, 950	8, 098, 829	1, 146, 167	$7, 399, 134	(2)	(2)	(2)	(2)	749, 402	5, 589, 067	2, 184, 750	15, 047, 225
Ohio	7, 213, 619	34, 684, 465	5, 621, 805	26, 613, 097	1, 094, 089	5, 510, 441	98, 823	709, 062	52, 899	226, 203	282, 830	1, 242, 026	1, 528, 641	7, 687, 732
Pennsylvania	11, 061, 084	44, 601, 757	9, 724, 488	38, 397, 032	1, 191, 691	5, 440, 135	(2)	(2)	(2)	(2)	55, 272	270, 990	1, 317, 472	6, 120, 394
Tennessee	122, 312	612, 783	30, 000	117, 978	28, 258	135, 409	25, 159	149, 878	----------	----------	20, 902	119, 070	74, 319	404, 357
Utah	197, 183	(2)	131, 006	(2)	46, 763	(2)	----------	----------	----------	----------	23, 595	(2)	70, 358	(2)
Washington	40, 570	283, 990	39, 038	273, 266	----------	----------	----------	----------	----------	----------	4, 749	33, 243	4, 749	33, 243
West Virginia	1, 396, 285	4, 679, 048	1, 114, 768	3, 550, 242	----------	----------	(2)	(2)	(2)	(2)	(2)	(2)	285, 133	1, 195, 214
Kentucky, Missouri, Rhode Island, and Wisconsin	1, 447, 830	10, 624, 596	(2)	(2)	(1)	(1)	383, 875	3, 185, 875	[1] 384, 047	[1] 2, 379, 657	592, 870	4, 384, 629	1, 360, 792	9, 950, 161
Undistributed	----------	16, 253, 681	18, 938	8, 559, 645	210, 896	1, 963, 166	718, 289	6, 810, 722	731, 123	8, 223, 783	336, 662	5, 176, 036	----------	7, 108, 159
	43, 884, 726	232, 043, 803	30, 687, 198	145, 123, 216	[3] 3,926,524	[3] 21,296,473	1, 938, 653	15, 112, 967	[1] 2, 022, 838	[1] 13,812,393	4, 702, 529	32, 447, 939	12, 590, 544	82, 669, 772

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[1] An insignificant amount of furnace coke is included with sales for industrial use in order to avoid disclosing individual operations. For this reason these columns do not balance.

[2] Included under "Undistributed."

[3] Includes 2,959,247 tons, valued at $15,903,197, sold to affiliated corporations, and 967,277 tons, valued at $5,393,276, reported as merchant sales.

BEEHIVE COKE DISTRIBUTED IN 1927

Corresponding data for beehive coke are given in Table 36. In 1927 the total sales amounted to 6,288,491 tons, including 2,017,616 tons of furnace coke sold to affiliated corporations, 2,780,433 tons of "merchant sales" for furnace use, 809,590 tons for foundry use, 569,749 tons for other industrial uses including manufacture of water gas, and 111,103 tons sold for domestic purposes.

The quantity of beehive coke used by the producers themselves was 905,359 tons. Practically all of this was consumed in blast furnaces or in other operations at associated iron and steel works, very little being used in smelting the nonferrous metals.

TABLE 36.—*Beehive coke produced and sold or used by the producer, by States, in 1927*

[Exclusive of screenings and breeze]

State	Produced		Used by producer in blast furnace, etc.		Sold									
					Furnace [1]		Foundry		Other industrial use (including water gas)		Domestic use		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Colorado	194,184	(2)	34,204	(2)	(2)	(2)	(2)	(2)	27,785	(2)	8,506	(2)	159,937	(2)
Pennsylvania	5,716,207	$22,568,318	469,272	$1,712,741	4,201,089	$16,320,799	599,823	$2,943,105	332,139	$1,070,785	102,534	$372,663	5,235,585	$20,707,352
Tennessee	104,808	536,821	(2)	(2)	(2)	(2)	(2)	(2)	----------	----------	----------	----------	41,124	186,399
Utah	84,865	(2)	----------	----------	84,865	(2)	----------	----------	----------	----------	----------	----------	84,865	(2)
Virginia	316,754	1,413,595	(2)	(2)	78,808	328,587	92,729	432,549	[3] 144,926	[3] 651,209	----------	----------	[3] 316,463	[3] 1,412,345
Washington	30,701	246,769	----------	----------	30,701	246,769	----------	----------	----------	----------	----------	----------	30,701	246,769
West Virginia	527,142	2,161,310	108,391	472,613	254,245	864,215	98,871	597,428	64,899	(2)	63	(2)	418,078	1,686,550
Georgia, Kentucky, and Ohio	232,756	1,317,756	(2)	(2)	----------	----------	1,738	13,291	(3)	(3)	----------	----------	[3] 1,738	[3] 13,291
Undistributed	----------	2,032,206	293,492	1,850,378	148,341	1,636,067	16,429	99,503	----------	432,449	----------	73,573	----------	1,830,286
	7,207,417	30,276,775	905,359	4,035,732	4,798,049	19,396,437	809,590	4,085,876	569,749	2,154,443	111,103	446,236	6,288,491	26,082,992

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[1] Includes 2,017,616 tons, valued at $9,153,274, sold to affiliated corporations, and 2,780,433 tons, valued at $10,243,163, reported as merchant sales.
[2] Included under "Undistributed."
[3] A small amount of coke sold for industrial purposes in Kentucky is included with Virginia.

RELATIVE GROWTH OF FURNACE, FOUNDRY, AND DOMESTIC COKE

As the construction of new by-product plants now depends chiefly on the degree to which the market for house fuel can be expanded, special interest attaches to the rate at which the sales for such use have been increasing. Tables 37 and 38 show the relative growth of the demand for furnace, foundry, and domestic uses over as long a period as possible.

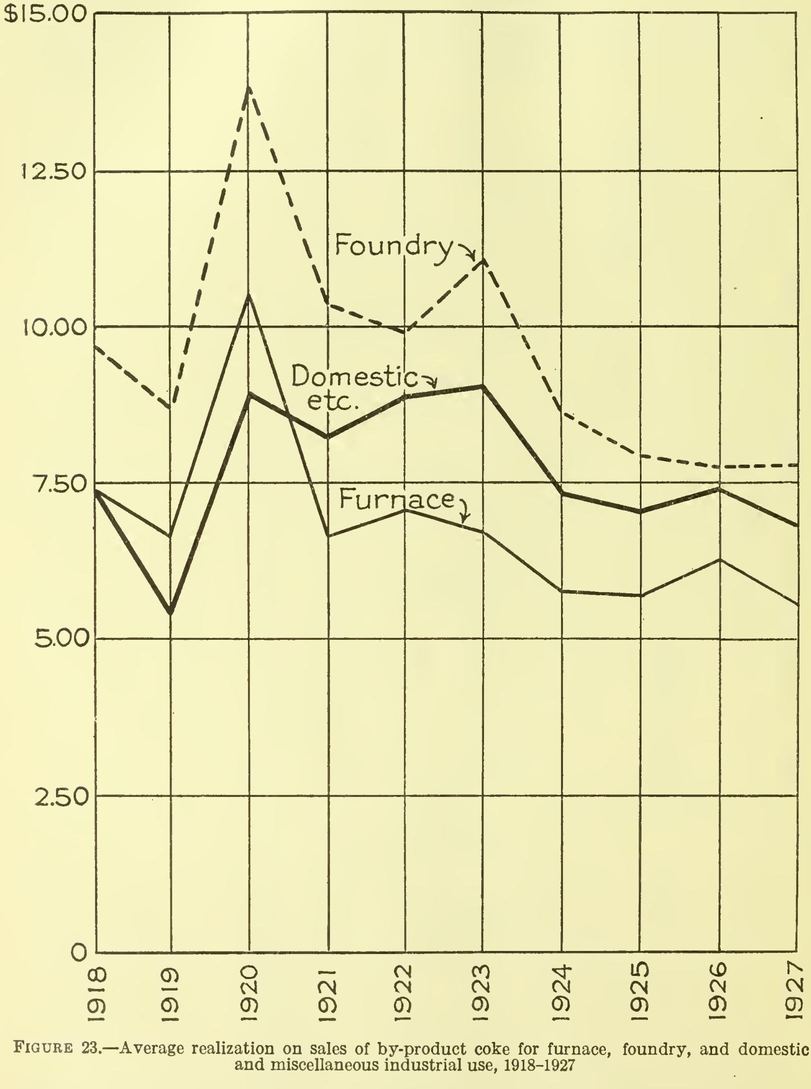

FIGURE 23.—Average realization on sales of by-product coke for furnace, foundry, and domestic and miscellaneous industrial use, 1918–1927

Table 37 shows the sales so classified and the quantity used by the producer for each year from 1918 to 1927. From 1918 to 1922 the operators were merely asked to state the total quantity of furnace, of foundry, and of domestic coke sold. For 1923 to 1927 the figures are based on the replies to the detailed questions listed on page 628.

The change in form of inquiry affects the comparability of the figures before 1923, but for 1923 to 1927 they are exactly comparable.

The movement of prices for the several grades of coke is indicated by the figures of average value per ton at the bottom of Table 37. (See also fig. 23.) Since 1920 the general trend of sales realizations has been downward, but the values obtained for domestic coke have compared more favorably with those for metallurgical coke than before. The curve of sales realizations on domestic coke (including sales for "other industrial use") shows the influence of the anthracite shortages of 1922–23 and 1926.

TABLE 37.—*Coke used by producer and sold for furnace, foundry, other industrial, and domestic use, 1918–1927*

[Exclusive of screenings and breeze]

Year	Used by producer in blast furnace or other affiliated works	Sold					
		Furnace		Foundry	Other industrial use (including water gas)	Domestic use	Total sales
		To affiliated corporations	Merchant sales				
Quantity (net tons):							
By-product—							
1918	17, 753, 348	4, 147, 695		1, 631, 052	2, 537, 059		8, 315, 806
1919	17, 767, 066	4, 677, 497		1, 480, 516	2, 885, 270		9, 043, 283
1920	22, 848, 461	4, 054, 964		1, 715, 982	2, 361, 737		8, 132, 683
1921	13, 470, 396	2, 593, 318		736, 391	1, 679, 911		5, 009, 620
1922	21, 106, 823	2, 934, 924		1, 601, 733	3, 865, 751		8, 402, 408
1923	27, 055, 397	2, 313, 412	1, 460, 538	1, 897, 955	1, 638, 226	2, 637, 518	9, 947, 649
1924	24, 023, 933	2, 335, 056	1, 590, 983	1, 553, 849	1, 556, 175	2, 812, 771	9, 848, 834
1925	28, 223, 838	2, 641, 729	1, 736, 112	1, 833, 372	2, 072, 635	4, 085, 068	12, 368, 916
1926	31, 334, 305	2, 127, 176	1, 566, 980	2, 168, 017	1, 662, 837	5, 056, 568	12, 581, 578
1927	30, 687, 198	2, 959, 247	967, 277	1, 938, 653	2, 022, 838	4, 702, 529	12, 590, 544
Beehive—							
1918	4, 885, 318	23, 216, 627		2, 230, 156	210, 511		25, 657, 294
1919	3, 023, 828	14, 574, 264		1, 349, 483	143, 930		16, 067, 677
1920	3, 204, 884	15, 188, 814		1, 807, 256	192, 142		17, 188, 212
1921	495, 481	3, 957, 709		1, 011, 343	56, 874		5, 025, 926
1922	1, 071, 886	6, 105, 003		1, 164, 716	179, 670		7, 449, 389
1923	2, 583, 507	7, 923, 783	6, 437, 771	1, 702, 764	645, 662	95, 896	16, 805, 876
1924	1, 574, 037	3, 582, 004	3, 357, 433	1, 363, 952	260, 046	139, 886	8, 703, 321
1925	2, 032, 944	3, 479, 728	3, 895, 983	1, 153, 665	572, 949	392, 698	9, 495, 023
1926	1, 575, 039	4, 260, 028	4, 156, 032	1, 163, 660	963, 797	386, 045	10, 929, 562
1927	905, 359	2, 017, 616	2, 780, 433	809, 590	569, 749	111, 103	6, 288, 491
Total—							
1918	22, 638, 666	27, 364, 322		3, 861, 208	2, 747, 570		33, 973, 100
1919	20, 790, 894	19, 251, 761		2, 829, 999	3, 029, 200		25, 110, 960
1920	26, 053, 345	19, 243, 778		3, 523, 238	2, 553, 879		25, 320, 895
1921	13, 965, 877	6, 551, 027		1, 747, 734	1, 736, 785		10, 035, 546
1922	22, 178, 709	9, 039, 927		2, 766, 449	4, 045, 421		15, 851, 797
1923	29, 638, 904	10, 237, 195	7, 898, 309	3, 600, 719	2, 283, 888	2, 733, 414	26, 753, 525
1924	25, 597, 970	5, 917, 060	4, 948, 416	2, 917, 801	1, 816, 221	2, 952, 657	18, 552, 155
1925	30, 256, 782	6, 121, 457	5, 632, 095	2, 987, 037	2, 645, 584	4, 477, 766	21, 863, 939
1926	32, 909, 344	6, 387, 204	5, 723, 012	3, 331, 677	2, 626, 634	5, 442, 613	23, 511, 140
1927	31, 592, 557	4, 976, 863	3, 747, 710	2, 748, 243	2, 592, 587	4, 813, 632	18, 879, 035
Total value:							
By-product—							
1918	(1)	$30, 792, 247		$15, 849, 017	$18, 907, 079		$65, 548, 343
1919	(1)	31, 028, 251		12, 865, 927	15, 607, 752		59, 501, 930
1920	(1)	42, 841, 222		23, 678, 225	21, 080, 429		87, 599, 876
1921	(1)	17, 202, 994		7, 662, 781	13, 809, 165		38, 674, 940
1922	(1)	20, 636, 494		15, 921, 431	34, 407, 054		70, 964, 979
1923	$168, 379, 600	$16, 307, 054	$9, 847, 055	19, 995, 342	$14, 845, 652	$23, 872, 007	84, 867, 110
1924	125, 838, 387	13, 495, 287	9, 149, 521	13, 425, 334	11, 854, 698	20, 063, 417	67, 988, 257
1925	134, 245, 288	13, 794, 422	9, 954, 964	14, 630, 450	14, 849, 829	28, 521, 425	81, 751, 090
1926	160, 606, 129	10, 955, 119	9, 800, 299	16, 836, 376	12, 285, 212	37, 567, 659	87, 444, 665
1927	145, 123, 216	15, 903, 197	5, 393, 276	15, 112, 967	13, 812, 393	32, 447, 939	82, 669, 772
Beehive—							
1918	(1)	137, 782, 308		16, 802, 144	1, 319, 053		155, 903, 505
1919	(1)	72, 007, 820		8, 364, 256	775, 467		81, 147, 543
1920	(1)	108, 943, 650		17, 209, 737	1, 545, 147		127, 698, 534
1921	(1)	20, 979, 386		5, 932, 599	272, 412		27, 184, 397
1922	(1)	33, 724, 440		8, 334, 400	1, 086, 014		43, 144, 854
1923	14, 045, 646	45, 756, 993	39, 326, 693	12, 259, 196	4, 112, 236	461, 971	101, 917, 089
1924	7, 872, 356	17, 706, 496	13, 507, 138	7, 543, 143	1, 052, 249	509, 333	40, 318, 359
1925	9, 502, 959	16, 497, 801	15, 722, 122	5, 971, 595	2, 494, 947	2, 240, 546	42, 927, 011
1926	7, 148, 961	20, 306, 453	16, 384, 006	5, 967, 936	4, 638, 542	2, 677, 741	49, 974, 678
1927	4, 035, 732	9, 153, 274	10, 243, 163	4, 085, 876	2, 154, 443	446, 236	26, 082, 992

[1] No data.

TABLE 37.—*Coke used by producer and sold for furnace, foundry, other industrial, and domestic use, 1918–1927*—Continued

Year	Used by producer in blast furnace or other affiliated works	Sold					
		Furnace		Foundry	Other industrial use (including water gas)	Domestic use	Total sales
		To affiliated corporations	Merchant sales				
Total value–Con.							
Total—							
1918	(1)	$168, 574, 555		$32, 651, 161	$20, 226, 132		$221, 451, 848
1919	(1)	103, 036, 071		21, 230, 183	16, 383, 219		140, 649, 473
1920	(1)	151, 784, 872		40, 887, 962	22, 625, 576		215, 298, 410
1921	(1)	38, 182, 380		13, 595, 380	14, 081, 577		65, 859, 337
1922	(1)	54, 360, 934		24, 255, 831	35, 493, 068		114, 109, 833
1923	$182, 425, 246	$62, 064, 047	$49, 173, 748	32, 254, 538	$18, 957, 888	$24, 333, 978	186, 784, 199
1924	133, 710, 743	31, 201, 783	22, 656, 659	20, 968, 477	12, 906, 947	20, 572, 750	108, 306, 616
1925	143, 748, 247	30, 292, 223	25, 677, 086	20, 602, 045	17, 344, 776	30, 761, 971	124, 678, 101
1926	167, 755, 090	31, 261, 572	26, 184, 305	22, 804, 312	16, 923, 754	40, 245, 400	137, 419, 343
1927	149, 158, 948	25, 056, 471	15, 636, 439	19, 198, 843	15, 966, 836	32, 894, 175	108, 752, 764
Value per ton:							
By-product—							
1918	(1)	7. 42		9. 72	7. 45		7. 88
1919	(1)	6. 63		8. 69	5. 41		6. 58
1920	(1)	10. 57		13. 80	8. 93		10. 77
1921	(1)	6. 63		10. 41	8. 22		7. 72
1922	(1)	7. 03		9. 94	8. 90		8. 45
1923	6. 22	7. 05	6. 74	10. 54	9. 06	9. 05	8. 53
1924	5. 24	5. 78	5. 75	8. 64	7. 62	7. 13	6. 90
1925	4. 76	5. 22	5. 73	7. 98	7. 16	6. 98	6. 61
1926	5. 13	5. 15	6. 25	7. 77	7. 39	7. 43	6. 95
1927	4. 73	5. 37	5. 58	7. 80	6. 83	6. 90	6. 57
Beehive—							
1918	(1)	5. 93		7. 53	6. 27		6. 08
1919	(1)	4. 94		6. 20	5. 39		5. 05
1920	(1)	7. 17		9. 52	8. 04		7. 43
1921	(1)	5. 30		5. 87	4. 79		5. 41
1922	(1)	5. 52		7. 15	6. 04		5. 79
1923	5. 44	5. 77	6. 11	7. 20	6. 37	4. 82	6. 06
1924	5. 00	4. 94	4. 02	5. 53	4. 05	3. 64	4. 63
1925	4. 67	4. 74	4. 04	5. 18	4. 35	5. 71	4. 52
1926	4. 54	4. 77	3. 94	5. 13	4. 81	6. 94	4. 57
1927	4. 46	4. 54	3. 68	5. 05	3. 78	4. 02	4. 15
Total—							
1918	(1)	6. 16		8. 46	7. 36		6. 52
1919	(1)	5. 35		7. 50	5. 41		5. 60
1920	(1)	7. 89		11. 61	8. 86		8. 50
1921	(1)	5. 83		7. 78	8. 11		6. 56
1922	(1)	6. 01		8. 77	8. 77		7. 20
1923	6. 15	6. 06	6. 23	8. 96	8. 30	8. 90	6. 98
1924	5. 22	5. 27	4. 58	7. 19	7. 11	6. 97	5. 84
1925	4. 75	4. 95	4. 56	6. 90	6. 56	6. 87	5. 70
1926	5. 10	4. 89	4. 58	6. 84	6. 44	7. 39	5. 84
1927	4. 72	5. 03	4. 17	6. 99	6. 16	6. 83	5. 76

[1] No data.

Table 38 continues the analysis by grouping the sales of furnace coke and the quantity reported as "used by producer." Although, as explained in the footnote of the table, the total includes small amounts of coke used for other purposes, it may be taken as roughly equivalent to the demand for furnace coke.

In 1915 the demand for furnace coke, including both beehive and by-product coke, calculated in this way, was about 36,703,000 tons and in 1916 about 47,875,000 tons. In 1927 it was 40,317,000 tons, an increase over 1915 but a decrease when compared with 1916. The demand for furnace coke has fluctuated without definite trend during the last decade.

The sales of foundry coke, including both beehive and by-product coke, were 1,665,000 tons in 1915 and 2,680,000 tons in 1916, but as the figures for these two years do not include exports they are not strictly comparable with those for the rest of the period. In 1918 the total sales of foundry coke, including the exports, were 3,861,000 tons; in comparison, the sales of 2,748,243 tons in 1927 show a decrease. It therefore appears that the demand for foundry coke also has shown no marked change during the last decade.

In contrast with the stationary demand for metallurgical coke the quantities sold for domestic and miscellaneous industrial uses have increased three to four fold during the same period. Total sales for domestic and miscellaneous industrial uses in 1916, including both beehive and by-product coke but excluding a small amount exported, were 2,616,000 tons. In 1918, including the exports, they were 2,748,000 tons, from which they increased to 7,406,000 in 1927.

Beginning with 1923 the miscellaneous industrial sales can be segregated from the sales for domestic purposes, and the growth of the domestic demand can be measured exactly. In 1923, a year when supplies of anthracite were limited, the sales of coke (including beehive coke) for domestic purposes totaled 2,733,000 tons. In 1927 they were 4,814,000 tons.

TABLE 38.—*Recapitulation of total supply of coke classified as furnace, foundry, other industrial, and domestic, 1915–1927, in net tons* [1]

[Exclusive of screenings and breeze]

Year	Furnace (including all coke used by producer)[2]	Foundry	Other industrial and domestic			Total sold and used by producer[3]
			Other industrial (not including coke used by producer)	Domestic	Total	
By-product:						
1918	21, 901, 043	1, 631, 052	(4)	(4)	2, 537, 059	26, 069, 154
1919	22, 444, 563	1, 480, 516	(4)	(4)	2, 885, 270	26, 810, 349
1920	26, 903, 425	1, 715, 982	(4)	(4)	2, 361, 737	30, 981, 144
1921	16, 063, 714	736, 391	(4)	(4)	1, 679, 911	18, 480, 016
1922	24, 041, 747	1, 601, 733	(4)	(4)	3, 865, 751	29, 509, 231
1923	30, 829, 347	1, 897, 955	1, 638, 226	2, 637, 518	4, 275, 744	37, 003, 046
1924	27, 949, 972	1, 553, 849	1, 556, 175	2, 812, 771	4, 368, 946	33, 872, 767
1925	32, 601, 679	1, 833, 372	2, 072, 635	4, 085, 068	6, 157, 703	40, 592, 754
1926	35, 028, 461	2, 168, 017	1, 662, 837	5, 056, 568	6, 719, 405	43, 915, 883
1927	34, 613, 722	1, 938, 653	2, 022, 838	4, 702. 529	6, 725, 367	43, 277, 742
Beehive:						
1918	28, 101, 945	2, 230, 156	(4)	(4)	210, 511	30, 542, 612
1919	17, 598, 092	1, 349, 483	(4)	(4)	143, 930	19, 091, 505
1920	18, 393, 698	1, 807, 256	(4)	(4)	192, 142	20, 393, 096
1921	4, 453, 190	1, 011, 343	(4)	(4)	56, 874	5, 521, 407
1922	7, 176, 889	1, 164, 716	(4)	(4)	179, 670	8, 521, 275
1923	16, 945, 061	1, 702, 764	645, 662	95, 896	741, 558	19, 389, 383
1924	8, 513, 474	1, 363, 952	260, 046	139, 886	399, 932	10, 277, 358
1925	9, 408, 655	1, 153, 665	572, 949	392, 698	965, 647	11, 527, 967
1926	9, 991, 099	1, 163, 660	963, 797	386, 045	1, 349, 842	12, 504, 601
1927	5, 703, 408	809, 590	569, 749	111, 103	680, 852	7, 193, 850
Total:						
1915	36, 702, 573	1, 664, 548	(4)	(4)	1, 974, 102	40, 341, 223
1916	47, 875, 153	2, 680, 104	(4)	(4)	2, 616, 320	53, 171, 577
1918	50, 002, 988	3, 861, 208	(4)	(4)	2, 747, 570	56, 611, 766
1919	40, 042, 655	2, 829, 999	(4)	(4)	3, 029, 200	45, 901, 854
1920	45, 297, 123	3, 523, 238	(4)	(4)	2, 553, 879	51, 374, 240
1921	20, 516, 904	1, 747, 734	(4)	(4)	1, 736, 785	24, 001, 423
1922	31, 218, 636	2, 766, 449	(4)	(4)	4, 045, 421	38, 030, 506
1923	47, 774, 408	3, 600, 719	2, 283, 888	2, 733, 414	5, 017, 302	56, 392, 429
1924	36, 463, 446	2, 917, 801	1, 816, 221	2, 952, 657	4, 768, 878	44, 150, 125
1925	42, 010, 334	2, 987, 037	2, 645, 584	4, 477, 766	7, 123, 350	52, 120, 721
1926	45, 019, 560	3, 331, 677	2, 626, 634	5, 442, 613	8, 069, 247	56, 420, 484
1927	40, 317, 130	2, 748, 243	2, 592, 587	4, 813, 632	7, 406, 219	50, 471, 592

[1] For 1915 and 1916 separate figures for by-product and beehive coke are not available; the total, however, is shown. For 1917 no data on this subject were collected.

[2] Sales of furnace coke plus the total quantity reported "used by producer." Includes coke consumed at associated iron and steel works for other than blast-furnace use, and also a small quantity consumed for purposes that have no relation to the manufacture of iron and steel, such as alkali manufacture, smelting nonferrous metals, and making water gas and producer gas at plants supplying gas for city distribution. The quantity used for these other purposes in 1926 was about 429,000 tons of by-product coke and 26,000 tons of beehive coke.

[3] These figures represent the quantity distributed in the year without taking into account changes in producers' stocks and therefore differ slightly from the published totals of production. In 1915 and 1916, moreover, they do not include the quantity exported.

[4] Not separated prior to 1923.

DOMESTIC COKE

Although the consumption of metallurgical coke has shown no great increase in recent years, the consumption of domestic coke has been growing rapidly. The construction of new by-product ovens now depends largely on the degree to which the market for house fuel can be expanded. Widespread interest in this subject has led to requests upon the bureau for additional information, and the following statement has been prepared in response.[1]

NEED OF SMOKELESS FUELS

In the part of the United States conveniently accessible to the mines of eastern Pennsylvania anthracite has long been the standard fuel for househeating. Anthracite is admirably adapted to this purpose because it burns without smoke or soot, makes little dust, and produces a fire that can be regulated with a minimum of attention. In many localities, however, anthracite is too expensive for the average consumer, largely because of the cost of transportation from the mines. Indeed, for most of the country bituminous coal is the fuel more commonly used, and, as shown by the following table, the total quantity of bituminous coal burned for househeating equals or exceeds the consumption of anthracite. The development of some fuel cleaner than the average raw bituminous coal is therefore a problem of great importance in many parts of the country.

TABLE 39.—*Commercial production of anthracite and total supplies of other fuels used for domestic purposes in the United States, 1924–1927*

[The figures for 1925 and 1926 were affected by the great strike of the anthracite miners which lasted from Sept. 1, 1925, to Feb. 18, 1926]

	1924	1925	1926	1927
Solid fuels (net tons)				
Anthracite production:				
Shipments of domestic sizes	56,576,296	38,305,222	54,096,437	48,999,058
Shipments of buckwheat No. 1 [a]	9,510,508	6,631,604	8,581,966	9,062,977
Shipments of smaller steam sizes	11,160,695	8,831,546	12,640,417	12,433,251
Local sales	3,043,939	2,884,577	2,687,411	3,046,770
Total commercial production	80,291,438	56,652,949	78,006,231	73,542,056
Anthracite exported	4,017,785	3,179,006	4,029,683	3,325,507
Anthracite imported, chiefly from United Kingdom	117,951	382,894	813,956	119,030
Fuel briquets produced	580,470	839,370	995,332	970,468
Fuel briquets imported	38	6,758	123,593	60,601
By-product coke sold for domestic use	2,812,771	4,085,068	5,056,568	4,702,529
Beehive coke sold for domestic use	139,886	392,698	386,045	111,103
Coke imported	82,833	201,579	284,548	168,859
Gas-house coke sold	(b)	(b)	(b)	(b)
Petroleum coke produced [c]	761,100	991,000	995,300	1,145,200
Bituminous coal for domestic use [d]	(e)	(e)	(e)	(e)
Oil (barrels)				
Oil used for heating houses [f]	2,800,000	5,000,000	9,080,000	11,000,000
Oil used for heating offices, hotels, apartments, schools, hospitals, and buildings other than houses	(g)	[h]12,100,000	14,266,000	14,800,000
Gas (million cubic feet)				
Natural gas consumed for domestic use	285,152	272,146	289,175	296,036

[a] A considerable part of the buckwheat No. 1 is used for domestic purposes.
[b] About 1,300,000 tons a year.
[c] How much of the petroleum coke produced was used for house fuel is not known. It is known that 314,000 tons in 1925, about 408,000 tons in 1926, and 450,000 tons in 1927 were used for refinery fuel.
[d] During the anthracite strike about 17,000,000 tons of bituminous coal in addition to the normal consumption was used to replace anthracite.
[e] From 56,000,000 to 77,000,000 tons a year.
[f] Figures relate to heating seasons, as follows: 2,800,000 barrels in season of 1923–24; 5,000,000 in season of 1924–25. The figures for 1926 and 1927 represent the calendar year
[g] No data.
[h] Partly estimated.

[1] Adapted from a paper by the senior author in Proceedings of World Power Conference, Fuel Conference, 1928. Domestic Fuels other than Anthracite; Part I. Processed Coals, by F. G. Tryon. Data on the use of raw coals and oil are given in other parts of the same paper, as follows: Part II, Domestic Heating from Coals Below the Rank of Anthracite, by F. M. Shore; Part III, Heating with Oil, by E. B. Swanson.

LOW-TEMPERATURE CARBONIZATION

In the United States, as elsewhere, there has been active interest in the carbonization of coal at low temperatures. Briquets made from low-temperature char or semicoke were sold by two plants in 1927—one at Fairmont [2] and the other at Moundsville, W. Va. Such a briquet, recarbonized to drive off smoke from the binder, is an excellent domestic fuel. Several other plants,[3] largely in the experimental stage, have from time to time made low-temperature coke, designed for domestic use. At a number of these plants the results have been encouraging enough to induce the owners to expand their capacity and to undertake the construction of new plants on a commercial scale. The quantities produced by low-temperature carbonization, however, still constitute an insignificant element in the total supply of house fuel. It remains a question of wide interest how successfully low-temperature methods can compete with anthracite and high-temperature coke under present conditions and price levels in the United States.

GAS COKE

Carbonization at high temperatures, on the other hand, is securely established as a source of domestic fuel in America, and the quantity of high-temperature coke sold for househeating is increasing rapidly. In the types of heating equipment used in the United States there is not the same need for a fuel with the qualities of low-temperature coke that exists in lands depending largely on open fires. The typical house in the Northern States is heated by a hot-water or hot-air furnace in the cellar; the fire is lighted in the fall and kept going until spring. In such a furnace coke of domestic size can be ignited without difficulty by building a fire of paper and kindling wood. The low volatile content of high-temperature coke is thus a matter of small importance under American conditions, and largely for this reason interest in low-temperature carbonization has centered on the recovery of oils and tar quite as much as on the production of domestic fuel.

American experience with high-temperature coke should, therefore, be of interest in all localities where the climate makes central heating of houses by furnaces advisable. High-temperature coking has proved well adapted to mass production, and whatever may be the future of low-temperature carbonization the high-temperature oven has demonstrated its ability to produce a smokeless house fuel at relatively low cost.

Gas coke has long been a familiar domestic fuel in communities where the local gas supply is coal gas made in horizontal D-shaped or vertical retorts. As many communities are supplied with natural gas or with water gas [4] and as many others use a mixture of water gas and coal gas (the coke from the coal-gas works being used for generator fuel in the water-gas plant), the quantity of gas coke thrown on the market has been small according to European standards. Excluding coke used by the manufacturer the sales of gas coke amount to about 1,300,000 tons a year, most of which is used for house fuel.[5] Gas coke suffers from its softness and friability. It is subject to excessive breakage if shipped by railroad and is usually disposed of locally at whatever prices can be obtained. Its size and often its quality are irregular, and as the gas retort is yielding to the by-product oven as a means of making coal gas the quantity of gas coke sold for domestic coke tends to decline.

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[2] See Carnegie Institute of Technology, Proceedings of the International Conference on Bituminous Coal, 1926, particularly McIntire, Development in Low-Temperature Distillation of Coal at Fairmont, W. Va.

[3] Carnegie Institute of Technology, work cited: Runge, The McEwen-Runge Process for the Low-Temperature Distillation of Coal; Greene, The Greene-Laucks Process; Piron and Crawford, The Piron Coal Distillation Process; Darrah, The Low-Temperature Distillation of Coal in Rotary Retorts; Parker, The Bussey Process of Low-Temperature Distillation; Wisner, The Missing Link in Low-Temperature Carbonisation.

[4] According to statistics of the American Gas Association 58 per cent of the manufactured gas distributed by public utilities for city supply in 1925 was water gas, 7 per cent oil gas, 19 per cent coke-oven gas, and 16 per cent coal gas made in horizontal or vertical retorts.

DOMESTIC BY-PRODUCT COKE

Increase in sales of domestic by-product coke.—Coke made in by-product ovens is much harder and firmer than gas coke, can be crushed and sized, stands shipment by rail for distances as great as 800 miles, is more uniform in quality, and brings correspondingly higher prices. The rapid increase in the quantity of by-product coke sold for domestic use (shown in fig. 24) has been an outstanding feature of the fuel market in the United States. From 1,408,000 tons in 1918 the sales for domestic use increased to 5,057,000 tons in 1926. The demand in 1926 was stimulated by a strike of the anthracite miners, but in the following year, when abundant supplies of anthracite were available, the by-product plants marketed 4,703,000 tons of domestic coke, or three and one-half times the quantity of 10 years before.[6]

When there has been an acute shortage of anthracite, coke from beehive ovens has also been drawn upon for domestic use; 386,000 tons were sold for this purpose in 1926. The following year, however, such sales fell to 111,000 tons (Tables 36 and 37), and with the gradual elimination of the beehive-coke oven the quantity is destined to shrink still further. In July, 1928, beehive ovens contributed only 7 per cent of the coke produced in the United States. Few beehive-coke plants are equipped to crush, screen, and size the coke satisfactorily for domestic use.

The rise of by-product coke for house use is associated with the rapid expansion of the by-product industry which began in 1914 and has continued since the World War. Fully 85 per cent of the capacity of existing American plants (including replacements of old ovens) has been built since August, 1914, and in the construction of the new ovens advantage has been taken of the latest improvements in design. Larger capacity per oven, shorter coking time, and the perfection of automatic machinery for charging coal and drawing the coke have made the by-product oven a conspicuous example of economy of labor. Operating costs have been so reduced that it can flourish even under the difficult market conditions of the United States, where the price of tar and of light oil is limited by cheap petroleum and the price of gas by the potential competition of carbureted water gas.

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[5] Mineral Resources of the United States, 1920, pt. 2, Manufactured Gas and By-Products in 1920, by R. S. McBride, p. 477.

[6] Data for 1918 to 1922 are given in Coke and By-products in 1922, pp. 734–736, and exclude noncommercial deliveries of small coke to the employees of certain steel companies. Data for 1923 to 1927 are given in Tables 37 and 38 of this report and details for 1927 in Table 35.

Changes in prices of domestic coke and other household fuels.—The growth of the production of domestic coke has been facilitated by changes in price in relation to that of other household fuels (fig. 25 and Table 40). The dominant factor that determines the retail price of coke is usually the price of anthracite delivered in the same community. The price of anthracite has advanced since 1920 because of increases in wage rates, whereas the cost of coking coal delivered at by-product plants has been steadily declining. Lower manufacturing costs have in turn permitted a reduction in the price of domestic coke, thereby stimulating sales. As the diagram shows, in 1920 the average price of domestic by-product coke f. o. b. ovens was $1.70 higher than that of the domestic sizes of anthracite f. o. b. mines. In 1927 this relation was reversed, and the average price of coke at the ovens was $1.43 less than that of anthracite at the mines. Direct comparison of the two means little, because it neglects the costs of transportation and marketing, but the opposing trends of the two curves are significant. It will be noted that, in contrast to the price of domestic sizes of anthracite, the prices of fuel briquets and of low-volatile bituminous coal have also declined.

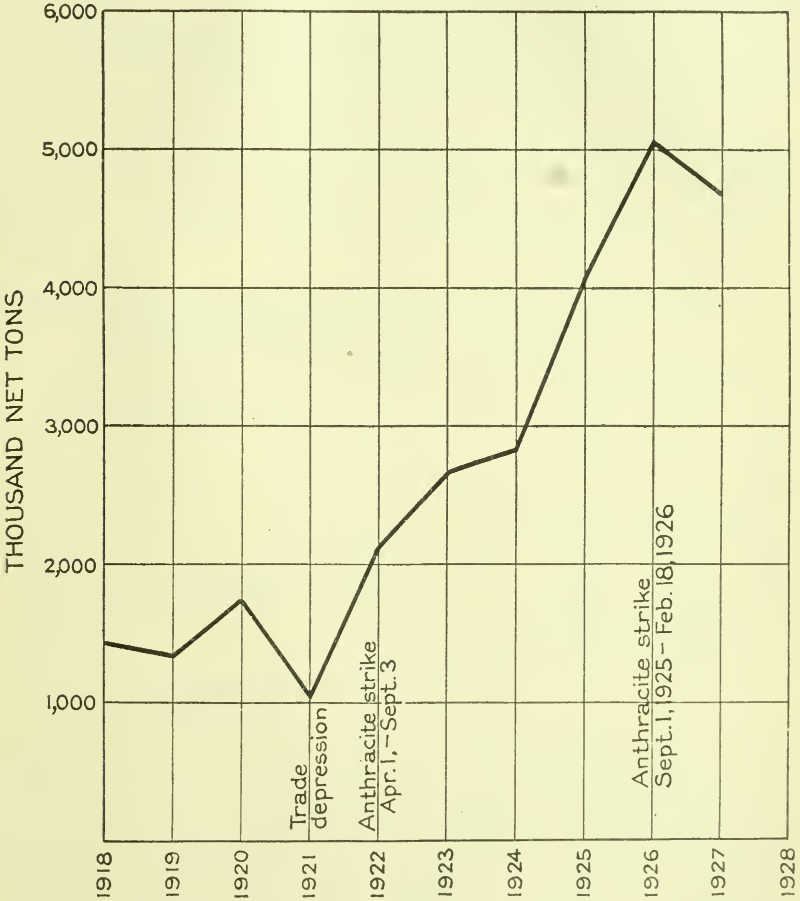

FIGURE 24.—By-product coke sold for domestic use in the United States, 1918-1927

TABLE 40.—*Price trends of domestic by-product coke and of other fuels suitable for household use, 1920–1927*

[Anthracite prices per gross ton; all others per net ton]

	Average price per ton							
	1920	1921	1922	1923	1924	1925	1926	1927
By-product coke, f. o. b. ovens:								
Sales for domestic and miscellaneous industrial use [1]	$8.93	$8.22	$8.90	$9.06	$7.31	$7.04	$7.42	$6.88
Sales for domestic use	(1)	(1)	(1)	9.05	7.13	6.98	7.43	6.90
Domestic anthracite, f. o. b. mines, average realization on breaker shipments [2]	7.23	7.39	7.77	8.23	8.25	8.30	8.66	8.33
Fuel briquets, Central States, f. o. b. plants	9.23	9.28	9.02	9.35	9.00	8.72	8.86	8.30
Cost of coking coal delivered at by-product plants	5.40	4.84	4.73	4.76	4.13	3.86	3.88	3.87
Low-volatile bituminous coal, f. o. b. mines [3]	4.52	3.00	2.74	3.16	1.96	1.90	2.04	1.93

[1] Until 1923 the sales for miscellaneous industrial use (a small item) were combined with those for domestic use.

[2] Includes pea and all larger sizes.

[3] Average (unweighted) of the average sales realization of operators in McDowell, Mercer, and Raleigh Counties, W. Va.

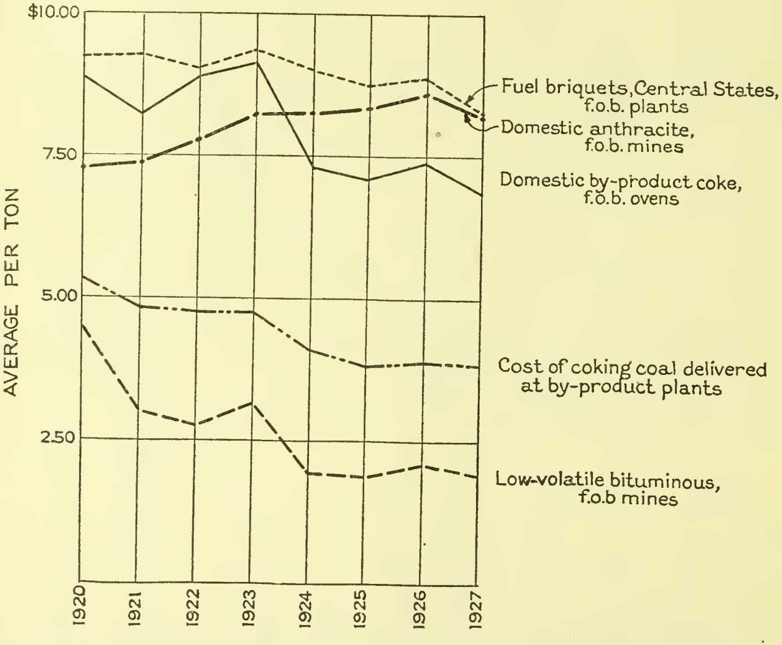

FIGURE 25.—Price trends of domestic by-product coke and of other solid fuels suitable for domestic use, 1920–1927

Domestic coke sold by iron and steel companies.—The supply of domestic by-product coke is derived in part from plants associated with iron and steel works, known to the trade as "furnace" plants, and in part from the so-called "merchant" plants. (See Table 41.) All but seven of the furnace plants are already equipped to screen and prepare their smaller coke for domestic use, the seven exceptions being in localities where the demand for house fuel is amply supplied by other means. In 1927 the domestic coke sold by plants affiliated with steelworks amounted to 868,079 tons, with a value f. o. b. ovens of $4,956,051, or $5.71 per ton. Ordinarily this coke is the residue left after the removal of pieces suitable for blast-furnace use, excluding, however, the breeze, which is separately reported. Much of this material is of the size known as pea, or less than three-fourths inch in diameter, and although usable for domestic heating it brings a lower price than the larger sizes known as egg, stove, and nut, which are especially prepared for domestic use by the merchant plants. A number of steel companies dispose of their domestic coke to their employees at nominal prices; others sell the surplus on the open market for such prices as they can obtain, sometimes directly and sometimes through middlemen. For these reasons the average returns obtained by the steelworks for their domestic coke are generally much lower than those obtained by the merchant plants.

When properly prepared, the small sizes produced by furnace plants are a helpful contribution to the national supply of house fuel. It should be remembered, however, that occasional sales of inferior coke do much to injure the reputation of all coke as a domestic fuel. The practice of withdrawing their product from the market during a fuel shortage, followed by some furnace interests, is particularly unfortunate, for it has tended to prejudice consumers against the use of coke.

TABLE 41.—*Sales of domestic by-product coke in 1927 by plants associated with iron and steel works and by merchant plants*

Type of plant	Net tons	Value at plant [1]	
		Total	Average per ton
Plants affiliated with iron and steel works	868,079	$4,956,051	$5.71
Merchant plants:			
Plants engaged largely in supplying gas for city distribution	2,169,674	17,393,323	8.02
Other merchant plants	1,664,776	10,098,565	6.07
Total merchant	3,834,450	27,491,888	7.17
Grand total	4,702,529	32,447,939	6.90

[1] Excludes costs of merchandising and delivery to consumer.

Merchant plants.—As the steel companies have now generally equipped themselves with by-product ovens, no great increase in the tonnage of domestic coke offered by furnace plants is expected, and further expansion in the supply must come chiefly from the nonfurnace or merchant ovens.[7] In 1927 the merchant plants sold a total of 3,834,450 tons for domestic use, with a value f. o. b. plant of $27,491,888, or $7.17 per ton. (Table 41.) This group includes a few plants affiliated with alkali works, a small number whose main business is the production of blast-furnace coke, but which have no direct affiliation with iron and steel companies, and a much larger number built to supply gas for city distribution. The last named are sometimes owned directly by the public-utility company distributing the gas, but more often they are separate corporations that operate as private companies and sell the gas under contract to the public-utility distributor. These plants are prepared to make blast-furnace coke where the market demands it but engage chiefly in the manufacture of foundry coke, domestic coke, and coke for miscellaneous industrial uses, the chief of which is water gas. A number of them sell nearly all of their output as domestic coke.

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[7] "The iron industry is now practically saturated, as regards coke production, and new ovens for this industry will be built only in proportion to the secular increase in iron requirements." C. J. Ramsburg, address before the National Fertilizer Association, June 14, 1928, p. 3.

A major problem in the operation of merchant plants is to adjust their production of coke to the demands of the market at the same time they are fulfilling their contract to supply gas. Flexibility of operation has been introduced by the practice of heating the ovens with producer gas or blue water gas when the demand for gas is at a maximum, thereby releasing the entire supply of coke-oven gas for sale and at the same time reducing the quantity of coke to be disposed of by using the smaller sizes in gas producers or water-gas generators. Conversely, when the demand for the gas is at a minimum and the market for coke active, the ovens are heated with coke-oven gas, thereby diminishing the surplus gas and increasing the amount of coke available for sale. By this means the relative proportions of gas and solid fuel produced for sale may be varied at will within limits. This single development has greatly widened the field open to by-product coke ovens.

The seasonal character of the domestic demand, however, makes it necessary for the coke operator to store his domestic product during the summer months. Table 44 shows the stocks of unsold coke at a group of 21 merchant plants in recent years. On October 1, 1926, these plants had accumulated a stock of 628,000 tons. By February 1, 1927, this had been reduced to 353,000 tons, but with the end of the heating season the surplus piled up rapidly and on October 1 reached nearly 800,000 tons.

Size of merchant plants.—The larger merchant plants include installations of 100 to as many as 250 ovens or even more. Plants of this size have naturally been located near large centers of population, such as Boston, New York, Buffalo, Detroit, Chicago, Milwaukee, Indianapolis, and Birmingham, where there is a market for both coke and gas. Seven merchant plants produced over 500,000 tons of coke each in 1927.

There have also been successful small installations. Six plants, of less than 20 ovens each, operated in 1927 with an average production of 34,600 tons. (Table 42.) These small plants include a number built within the last four years. By suitable modifications in design by-product ovens are now adapted to use in communities of 50,000 to 20,000 population, as shown by recent installations in Michigan, in Massachusetts, and in New York State. Experiments with still smaller installations are being made.[8]

The average production of the 36 merchant plants in 1927 was 272,000 tons each, and the average quantity sold for domestic use was 106,400 tons, or 39.1 per cent of the production. The percentage (of plant output) sold for domestic use varied greatly. At a number of plants the domestic trade absorbs two-thirds of the total output. One plant in a city of 300,000 inhabitants sold 86 per cent of its output for domestic use.

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[8] McBride, R. S., Miniature Coke Ovens to Serve the Small Community: Am. Gas Jour., July, 1927, pp. 27-31.

TABLE 42.—*Classification of merchant by-product coke plants according to number of ovens in 1927*

Ovens per plant	Number of plants	Annual production of coke per plant (net tons)	Annual sales of domestic coke per plant (net tons)	Per cent of production sold for domestic use
Less than 20 ovens	6	34,600	18,400	53.2
20 to 29 ovens	[1] 5	60,600	5,800	9.6
30 to 49 ovens	6	134,000	46,500	34.7
50 to 99 ovens	7	268,000	111,000	41.4
100 to 199 ovens	8	456,000	171,000	37.5
200 ovens and over	4	733,000	320,000	43.7
Total and average	36	272,000	106,400	39.1

[1] Includes 1 plant which started operations late in year and 1 gas-company plant which sold all its product for blast-furnace use.

Properties of domestic coke.—Representative analyses of coke made for domestic use, as reported by the manufacturers, show a volatile content of 0.7 to 2.0 per cent, sulphur 0.6 to 1.5 per cent, ash 7 to 15 per cent, and a fusing temperature of ash ranging from 2,300° to 2,800° F. A few installations operated by city gas companies report a volatile content of 3 per cent; but, as already stated, the percentage of volatile matter is found to be of small importance under American conditions. Moreover, the percentage of sulphur has no practical importance, as any coal meeting the requirements of gas manufacture or metallurgical use will also satisfy the domestic trade in this respect. On the other hand, a low ash content is a great advantage. According to Rose—

> In some cases coals less than 6 per cent ash are regularly used, and the 8 or 9 per cent ash coke is suitable * * * for the most strongly competitive markets. Domestic cokes containing 10 to 15 per cent ash may be classed in most localities as good to fair, respectively. Nut-size coke of still higher ash content is produced by some plants, but it is not made with the requirements of the domestic trade in view and is usually sold at a considerably lower price than first quality domestic coke.[9]

Another factor of great importance is the fusing temperature of the ash; a low fusing temperature causes clinker formation in the domestic furnace and leads to many complaints. In general, the higher the fusing temperature the better, and many plants that supply the domestic trade aim to keep the fusing point at 2,500° to 2,800° F., although other cokes with a favorable reputation in the localities served have a fusing point as low as 2,300° to 2,400° F. "The American Society for Testing Materials standard specifications for gas and coking coals give 2,200° F. as the minimum, but this is unquestionably a low limit." [10] One company wrote to the Bureau of Mines summarizing its experience with fusing temperature, as follows:

> We find that it is desirable to keep the fusing temperature as high as possible and much prefer 2,700° F. or above. A fusing temperature of 2,300° F. causes many complaints, and some people will not buy that kind of coke if they can get a coke with higher fusing temperature. A coke which runs 2,500° F. will give

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[9] Rose, H. J., The Selection of Coals for the Manufacture of Coke: Am. Inst. Min. and Met. Eng.; paper presented at February, 1926, meeting, p. 36.

[10] Rose, H. J., work cited, p. 37.

> fair results, although there will be complaints of clinker formation. The company that can maintain a temperature of 2,700° F. is most certainly in a position to get business that companies with a lower fusing point * * * are not able to obtain.

That domestic coke should be as dense as possible is usually desirable for its chief disadvantage in comparison with coal is greater bulk per unit of weight, reducing the amount that can be charged at one firing and increasing the amount of storage space required to accommodate the winter's supply.

Selection of coals for domestic coke.—As ash content and fusing temperature depend directly on the coal used, much attention is paid to the selection of suitable coals, and companies specializing in the production of domestic coke go to great expense to obtain coal meeting the requirements. A coal satisfactory for metallurgical coke may be rejected in preference to another of higher ash-fusing temperature. Even plants that make both foundry and domestic coke select a coal of high fusing point, for although theoretically a low fusing point is an advantage in foundry coke actually foundrymen give it small attention. The low-volatile coals of the Pocahontas and New River fields and the high-volatile coals of the Pittsburgh seam and of southern West Virginia and Virginia are among those favored for domestic coke.

Sizes sold.—Coke designed for the domestic trade must be carefully screened to remove all the breeze and sized to meet the requirements of the local market. All plants that make a specialty of domestic coke are equipped to crush and size the product. The sizes most commonly made are egg and nut, although stove and pea are also prepared. The dimensions of these sizes are not uniform, but the following will indicate the approximate limits: Egg, 3 to 2¼ inches; stove, 2¼ to 1¼ inches; nut, 1¼ to ¾ inch; and pea, ¾ to ½ inch. Where only two sizes are prepared, the egg commonly includes the stove, as given above, and the nut commonly includes the pea. Differentials are introduced in the retail prices on several sizes, depending on the local market. In general, egg and nut bring about the same price, with egg sometimes 25 to 50 cents higher, while pea usually sells for about $2 a ton less.

The prices obtainable for coke vary with the locality, the dominant factor being the cost of other fuels. In regions where anthracite is the established fuel coke must usually be offered at $1 to $2 a ton less.

Distribution.—Plants within motor trucking distance of the communities they serve can make deliveries direct to householders' cellars, with consequent saving in freightage and the breakage connected with the loading and unloading of railroad cars. The percentage handled in this way varies greatly. Many of the newer plants, built primarily to serve the household trade and furnish city gas, dispatch the bulk of their domestic coke by truck. One company that sells 150,000 tons of domestic coke delivers it all by truck within a radius of 10 miles from its plant. Still other companies, not so favorably located for trucking, ship all their coke by rail. Deliveries to retail coal dealers are usually made by rail (or barge in port cities) even when the dealer's yard is in the same city as the coke plant. Some coke companies have established retail yards of their own, to which they first ship by rail, making local deliveries by motor truck.

A coke plant is by no means limited to the local market, however, for by-product coke is hard enough to endure shipment without undue breakage. Each plant tends to become a center of distribution, first supplying the local market and then spreading out into the surrounding territory. The radius of distribution may be 50 to 500 miles, depending on the competition of other fuels, particularly coke from other plants. Indeed, certain plants in the South, where the local market is small, ship domestic coke 600 or even 800 miles.

Marketing problems.—Except for plants long distances from satisfactory markets producers seldom utilize wholesalers in marketing domestic coke and either sell it directly themselves or through an affiliated sales company.

With respect to retailing, policy varies widely. One company with a long-established business in the Middle West sells 96 per cent of its domestic coke through retailers. Another, recently established on the Atlantic coast, sells only 2 per cent through retailers and places 98 per cent of its tonnage direct with householders. Most companies occupy a position somewhere between these extremes. In communities where coke is well known in the retail trade producers are usually glad to utilize coal merchants already in business. On the other hand, to introduce coke in a new community requires much sales effort, and this producing companies usually find it advisable to undertake themselves. Later, when the demand has been created, local retailers can often give effective service.

In addition to advertising, it is necessary to do much patient work in assisting consumers to select the sizes best suited to their equipment and in teaching proper methods of firing. Dependable service must be maintained and complaints given immediate and personal attention. No attempt is made within the limits of this paper to describe the methods recommended for burning coke or to discuss its relative merits in comparison with soft coal or anthracite. It will be apparent, however, that the greater volume of coke per unit of weight necessitates different methods of firing and that the expansion of the domestic market in recent years has required a sales effort of no small proportions.

Possible further expansion.—Over the United States as a whole coke now supplies about 5 per cent of the total domestic fuel consumed. In the northern cities where by-product coke plants have been built the proportion is much higher, ranging from 7 per cent in some of the largest cities to 25 per cent in one city of 270,000 population and to as high as 30, 40, or even 50 per cent in certain smaller communities. On the other hand, cities with no local supply use smaller percentages of coke and often rely almost entirely on other fuel. The consumption of coke is thus distributed very unevenly, and further expansion depends largely on the construction of new by-product plants in localities where the potential market for coke has not yet been developed.

The construction of new plants, however, is also interrelated with finding outlets for the gas. Without a balanced demand for both coke and gas within the radius of economic transmission coke ovens can hardly compete with other sources of fuel. Their adaptability to mass production and the degree of flexibility introduced by heating the ovens with producer gas have made them an efficient means of producing city gas; but they will be installed only where the net cost of gas, all credits considered, is less than the cost by alternative methods of manufacture. The final choice can be determined only after local conditions have been considered.

In comparison with coal-gas retorts the advantage is usually with coke ovens because their savings in labor cost more than offset the higher fixed charges.[11] In comparison with the cost of producing water gas the decision turns on a number of factors, including the fluctuating price of oil for carburetting. However, under many conditions coke ovens have become the most economical source for base-load city supply. In 1921 coke ovens furnished only 11 per cent of the manufactured gas distributed for city use and in 1926, 20 per cent. Since January 1, 1926, there have been nine installations of by-product ovens for city gas manufacture, and five more are now under construction, including a plant at Montreal, Canada. (Table 43.)

C. J. Ramsburg summarizes prospects for the construction of additional ovens for city gas supply as follows:

> The gas industry is a unit in the belief that in the future the base-load gas for practically all locations will be coke-oven gas or coal-retort gas, and for this reason there will probably be a large number of small and some large plants built in the future.[12]

TABLE 43.—*By-product coke ovens, directly supplying city gas companies, built since January 1, 1926, or under construction July 1, 1928*

[The table does not include a considerable number of installations of gas-making equipment resembling coke ovens on a small scale]

Company and location	Number of ovens [a]	Type of ovens	Annual coal capacity (net tons) [b]	Annual coke capacity (net tons) [c]
1926				
Consolidated Gas Co., New York, N. Y	74	Koppers-Becker	638,750	447,125
New England Fuel & Transportation Co., Boston, Mass.	51	Wilputte	372,000	260,000
Rochester Gas & Electric Co., Rochester, N. Y	37	Koppers-Becker	170,000	119,000
Utica Gas & Electric Co., Utica, N. Y	21	do	100,000	70,000
1927				
Battle Creek Gas Co., Battle Creek, Mich	7	do	35,000	25,000
Citizens Gas Co., Indianapolis, Ind	40	Wilputte	197,000	138,000
Consumers Power Co., Flint, Mich	29	Koppers-Becker	118,000	83,000
Rochester Gas & Electric Co., Rochester, N. Y	23	do	104,000	73,000
West Boston Gas Co., Framingham, Mass	15	do	47,523	33,266
1928				
Connecticut Coke Co., New Haven, Conn	61	do	416,000	291,000
North Shore Coke & Chemical Co., Waukegan, Ill	31	do	165,000	116,000
Montreal Coke & Manufacturing Co., Montreal, Canada.	59	do	450,000	315,000
Brooklyn Union Gas Co., Brooklyn, N. Y	74	do	691,310	483,917
Philadelphia Coke Co., Philadelphia, Pa	74	do	728,000	510,000

[a] Note that no figures are given for plants not supplying city gas companies. The total number of new ovens built in 1926 (excluding replacements) was 426, and in 1927 it was 759.

[b] The figures as to number of ovens and coal capacity are taken from a paper by C. J. Ramsburg presented June 14, 1928, before the National Fertilizer Association, supplemented by data in Iron Age, Jan. 26, 1928, p. 268.

[c] Computed from preceding column assuming an average yield of 70 per cent.

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[11] McBride, R. S., work cited, p. 31.

[12] Ramsburg, C. J., work cited, p. 3.

HOUSEHEATING WITH MANUFACTURED GAS

At the same time that the use of domestic coke is growing, a parallel development in the heating of houses with gas is tending to expand the outlets for manufactured gas. Although the number of houses heated with gas is still very small, the movement has passed the experimental stage and is increasing at a rapid rate. In Massachusetts 1,740 homes are now heated with gas, an increase of 690 over last year.[13]

Baltimore will serve as an example of the development of gas heating. The first installation was made 14 years ago. There are now 1,700 houses heated with gas, less than 1 per cent of the total number in the city; the number of installations has been increasing at the rate of 200 a year. The gas, a mixture of 50 per cent water gas and 50 per cent coke-oven gas, is obtained from a near-by steelworks and sold for househeating at approximately 65 cents per M cubic feet. A consumer desiring to heat with gas has the expense of installing a special furnace, and the price of the gas is equivalent to coal at $22 a ton. (This computation assumes a much higher efficiency in the special gas furnace than is obtained in the coal furnace.) The extra investment in the furnace and the high cost of the fuel indicate that gas heating is a luxury but evidently one for which many families will gladly pay to avoid the dust and smoke of bituminous coal and the labor of stoking the fire and handling ashes. The gas furnace is an example of the tendency toward automatic heating, perhaps the most interesting development in the field of household fuel in the United States.

STOCKS OF COKE

TABLE 44.—*Stocks of unsold coke at 21 by-product coke plants supplying gas for city use, 1922–1927, in net tons*

1922	
Jan. 1	1,017,000
Mar. 1	987,000
Oct. 1	250,000
Nov. 1	228,000
1923	
Jan. 1	212,000
Feb. 1	146,000
Mar. 1	92,000
June 1	202,000
July 1	308,000
Aug. 1	430,000
Sept. 1	501,000
Oct. 1	476,000
1924	
Jan. 1	772,000
Sept. 1	1,114,000
1925	
Mar. 1	631,000
June 1	722,000
Sept. 1	865,000
Nov. 1	623,000
1926	
Jan. 1	248,000
Feb. 1	90,000
Apr. 1	53,000
May 1	151,000
July 1	334,000
Aug. 1	470,000
Oct. 1	628,000
Nov. 1	579,000
1927	
Jan. 1	516,000
Feb. 1	353,000
Apr. 1	470,000
May 1	560,000
July 1	584,000
Aug. 1	705,000
Oct. 1	799,000
Dec. 31	787,000

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[13] Massachusetts Special Commission on the Necessaries of Life, Summary of Fuels Used for Heating Homes in Massachusetts: May 16, 1928.

TABLE 45.—*Stocks of coke and of breeze at end of 1927, by States, in net tons*

[Based on complete reports from all producers, including the 21 plants covered in Table 44]

State	Furnace and foundry	Domestic and other	Breeze
By-product plants:			
Alabama	340,411	26,340	54,920
Colorado	14,698		
Illinois	21,392	225,281	96,585
Indiana	12,863	90,741	13,073
Maryland	3,012		33,650
Massachusetts	(1)	[1] 75,203	4,788
Michigan	3,738	102,486	40,770
Minnesota	13,547	44,612	313
New Jersey		121,869	606
New York	97,272	119,008	31,752
Ohio	60,554	144,761	47,901
Pennsylvania	60,349	2,142	18,898
Tennessee	20,925	1,410	3,610
Utah	3,871	12,667	29,270
Washington	(1)	[1] 8,921	
West Virginia	(1)	[1] 27,548	14,300
Kentucky, Missouri, Rhode Island, and Wisconsin	1,971	156,639	8,539
	[1] 654,603	[1] 1,159,628	398,975
Beehive plants:			
Colorado	1,597		
Pennsylvania	52,330	3,717	34,894
Tennessee	5,286		
Utah	565		
Virginia	1,458		20
West Virginia	4,142	430	
Georgia, Kentucky, and Ohio	2,678		
	68,056	4,147	34,914

[1] A small amount of furnace and foundry coke is included with domestic and other.

CONSUMPTION OF COKE

Allowing for imports and exports and for changes in producers' stocks, the indicated consumption of coke in 1927 was 49,874,045 tons. (Table 46.) Of this about 38,200,000 tons was consumed by blast furnaces in the manufacture of pig iron and ferro-alloys. The remainder was used in foundries, in smelting the nonferrous metals, in the manufacture of water gas, in miscellaneous other industrial uses, and for domestic heating. In 1927 the quantity consumed for these purposes was 11,674,045 tons, or 23.4 per cent of the total, as against 8,221,060 tons, or 18.1 per cent in 1913.

The consumption figures in Table 46 for the years 1922 to 1927 differ slightly from those heretofore published because for the first time allowance has been made for changes in the stocks of coke held by producers.

The noteworthy improvement in efficiency of fuel utilization in blast-furnace operation during recent years is shown in Table 47. The quantity of coking coal required to make a gross ton of pig iron declined from an average of 3,637.2 pounds in 1913 to 3,093.7 pounds in 1927.

TABLE 46.—*Quantity of coke consumed in the manufacture of pig iron and for other purposes, 1913–1927, in net tons*

Year	Total production of coke	Imports	Exports	Net changes in stocks	Indicated United States consumption [1]	Consumed by iron furnaces [2]		Remainder consumed in other ways	
						Quantity	Per cent	Quantity	Per cent
1913	46, 299, 530	101, 212	987, 395	(3)	45, 413, 347	37, 192, 287	81. 9	8, 221, 060	18. 1
1914	34, 555, 914	133, 226	663, 585	(3)	34, 025, 555	27, 070, 856	79. 6	6, 954, 699	20. 4
1915	41, 581, 150	53, 222	895, 509	(3)	40, 738, 863	33, 224, 328	81. 6	7, 514, 535	18. 4
1916	54, 533, 585	54, 955	1, 174, 645	(3)	53, 413, 895	44, 431, 905	83. 2	8, 981, 990	16. 8
1917	55, 606, 828	24, 872	1, 409, 320	(3)	54, 222, 380	44, 493, 316	82. 1	9, 729, 064	17. 9
1918	56, 478, 372	30, 168	1, 687, 824	(3)	54, 820, 716	45, 703, 594	83. 4	9, 117, 122	16. 6
1919	44, 180, 557	16, 486	716, 956	(3)	43, 480, 087	35, 250, 943	81. 1	8, 229, 144	18. 9
1920	51, 345, 043	41, 143	919, 802	(3)	50, 466, 384	41, 976, 171	83. 2	8, 490, 213	16. 8
1921	25, 287, 622	30, 990	306, 755	(3)	25, 011, 857	18, 162, 147	72. 6	6, 849, 710	27. 4
1922	37, 124, 012	94, 228	511, 541	−805, 000	37, 511, 699	29, 213, 893	77. 9	8, 297, 806	22. 1
1923	56, 977, 534	85, 002	1, 237, 342	+651, 737	55, 173, 457	44, 761, 526	81. 1	10, 411, 931	18. 9
1924	44, 269, 605	82, 833	659, 350	−258, 020	43, 951, 108	34, 303, 060	78. 0	9, 648, 048	22. 0
1925	51, 266, 943	201, 579	953, 812	−854, 561	51, 369, 271	39, 241, 812	76. 4	12, 127, 459	23. 6
1926	56, 865, 537	284, 548	987, 260	+600, 021	55, 562, 804	[4]40, 600, 000	73. 1	14, 962, 804	26. 9
1927	51, 092, 143	168, 859	806, 664	+580, 293	49, 874, 045	[4]38, 200, 000	76. 6	11, 674, 045	23. 4

[1] Production plus imports minus exports, plus or minus the decrease or increase, respectively, of the net changes in stocks.

[2] From Annual Report of American Iron and Steel Institute

[3] Data not available.

[4] Includes an estimate for coke consumed in the manufacture of ferro-alloys which was not reported by the institute.

TABLE 47.—*Pounds of coke and of coking coal consumed per gross ton of pig iron made in the United States, 1913–1927*

Year	Pounds of coke per gross ton of pig iron and ferro-alloys [1]	Per cent yield of coke from coal	Calculated pounds coking coal per gross ton of pig iron and ferro-alloys	Year	Pounds of coke per gross ton of pig iron and ferro-alloys [1]	Per cent yield of coke from coal	Calculated pounds coking coal per gross ton of pig iron and ferro-alloys
1913	2, 433. 3	66. 9	3, 637. 2	1921	2, 200. 6	68. 0	3, 236. 2
1914	2, 354. 4	66. 9	3, 519. 3	1922	2, 176. 3	68. 3	3, 186. 4
1915	2, 252. 0	67. 2	3, 351. 2	1923	2, 243. 3	67. 5	3, 323. 4
1916	2, 285. 3	66. 8	3, 421. 1	1924	2, 212. 0	68. 1	3, 248. 2
1917	2, 339. 7	66. 4	3, 523. 6	1925	2, 150. 4	68. 8	3, 125. 6
1918	2, 375. 2	66. 4	3, 577. 1	1926 [2]	2, 091. 1	68. 6	3, 048. 3
1919	2, 310. 2	67. 4	3, 427. 6	1927 [2]	2, 122. 3	68. 6	3, 093. 7
1920	2, 305. 6	67. 4	3, 420. 8				

[1] From Annual Report of American Iron and Steel Institute.

[2] Communication by the secretary of the American Iron and Steel Institute. As published in the institute's report, the figures represent the consumption per gross ton of pig iron exclusive of ferro-alloys and amount to 2,060.9 pounds for 1926 and 2,094.1 pounds for 1927.

VALUE AND PRICE

TABLE 48.—*Average receipts per net ton for coke sold, by States, in 1927*

State	By-product				Beehive			
	Furnace	Foundry	Other industrial, etc.	Domestic	Furnace	Foundry	Other industrial, etc.	Domestic
Alabama	(1)	$5.28	$4.58	$3.80	--------	--------	--------	--------
Colorado	--------	--------	(1)	--------	(1)	(1)	(1)	(1)
Georgia	--------	--------	--------	--------	--------	(1)	--------	--------
Illinois	$6.90	(1)	9.02	6.91	--------	--------	--------	--------
Indiana	(1)	8.52	7.02	5.75	--------	--------	--------	--------
Kentucky	(2)	(2)	--------	(2)	--------	--------	(3)	--------
Maryland	--------	--------	(1)	(1)	--------	--------	--------	--------
Massachusetts	(1)	(1)	(1)	8.64	--------	--------	--------	--------
Michigan	--------	(1)	(1)	6.70	--------	--------	--------	--------
Minnesota	--------	(1)	(1)	(1)	--------	--------	--------	--------
Missouri	(2)	(2)	(2)	(2)	--------	--------	--------	--------
New Jersey	(1)	(1)	(1)	(1)	--------	--------	--------	--------
New York	6.46	(1)	(1)	7.46	--------	--------	--------	--------
Ohio	5.04	7.18	4.28	4.39	--------	--------	--------	--------
Pennsylvania	4.57	(1)	(1)	4.90	$3.88	$4.91	$3.22	$3.63
Rhode Island	--------	(2)	(2)	(2)	--------	--------	--------	--------
Tennessee	4.79	5.96	--------	5.70	(1)	(1)	--------	--------
Utah	(1)	--------	--------	(1)	(1)	--------	--------	--------
Virginia	--------	--------	--------	--------	4.17	4.66	[3] 4.49	--------
Washington	--------	--------	--------	7.00	8.04	--------	--------	--------
West Virginia	--------	(1)	(1)	(1)	3.40	6.04	(1)	(1)
Wisconsin	--------	(2)	(2)	(2)	--------	--------	--------	--------
Combined States	(1)	8.30	(1)	7.40	--------	--------	--------	--------
Undistributed	5.92	8.64	6.58	8.20	7.02	6.21	4.67	8.59
	5.42	7.80	6.83	6.90	4.04	5.05	3.78	4.02

[1] Included under "Undistributed."
[2] Included under "Combined States."
[3] A small tonnage for Kentucky is included in Virginia in calculating the average for that State.

TABLE 49.—*Average value per ton of all coke produced, 1913–1927, and average receipts per ton for coke sold, 1918–1927*

Year	Value per ton produced [1]			Receipts per ton sold		
	By-product	Beehive	Total	By-product	Beehive	Total
1913	$3.83	$2.39	$2.78	(2)	(2)	(2)
1914	3.39	2.15	2.56	(2)	(2)	(2)
1915	3.45	2.07	2.54	(2)	(2)	(2)
1916	3.95	2.69	3.13	(2)	(2)	(2)
1917	6.18	4.81	5.36	(2)	(2)	(2)
1918	7.42	6.21	6.77	$7.88	$6.08	$6.52
1919	6.37	5.15	5.85	6.58	5.05	5.60
1920	10.15	7.94	9.27	10.77	7.43	8.50
1921	5.95	5.45	5.84	7.72	5.41	6.56
1922	6.59	5.84	6.42	8.45	5.79	7.20
1923	6.85	5.98	6.56	8.53	6.06	6.98
1924	5.76	4.70	5.51	6.90	4.63	5.84
1925	5.28	4.56	5.12	6.61	4.52	5.70
1926	5.65	4.57	5.41	6.95	4.57	5.84
1927	5.29	4.20	5.13	6.57	4.15	5.76

[1] Includes operators' statements of the value of coke consumed by them in associated enterprises but not sold, except that in 1918 and 1920 the value of such coke was estimated for each State at the average value for that State of the part of the product reported sold.
[2] Data not available.

TABLE 50.—*Average value per net ton of coke exported from the United States, 1900–1927*

[Computed from records of Bureau of Foreign and Domestic Commerce]

Year	Average value	Year	Average value	Year	Average value
1900	$3.22	1910	$3.10	1920	$10.87
1901	3.63	1911	3.14	1921	9.00
1902	4.06	1912	3.29	1922	8.44
1903	4.49	1913	3.35	1923	9.61
1904	3.94	1914	3.37	1924	7.47
1905	3.34	1915	3.45	1925	7.20
1906	3.21	1916	3.58	1926	7.07
1907	3.27	1917	6.06	1927	6.73
1908	3.11	1918	7.03		
1909	3.22	1919	7.15		

TABLE 51.—*Average monthly prices per net ton at ovens of spot or prompt Connellsville furnace and foundry coke, 1918–1927* [1]

Month	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
FURNACE										
January	$6.00	$5.65	$6.00	$5.06	$2.75	$8.05	$3.94	$3.94	$7.19	$3.50
February	6.00	4.44	6.00	4.50	3.04	7.13	4.08	3.63	7.31	3.38
March	6.00	4.06	6.00	4.35	3.25	7.25	4.08	3.35	3.05	3.35
April	6.00	3.65	9.60	3.50	4.48	6.31	3.75	3.04	3.00	3.20
May	6.00	3.69	12.00	3.25	6.00	5.15	3.25	3.00	2.91	2.94
June	6.00	4.00	15.00	3.00	6.75	4.75	3.19	2.77	2.83	2.93
July	6.00	4.07	17.20	2.81	10.75	4.55	3.00	2.83	2.84	3.00
August	6.00	4.31	17.75	2.75	12.80	4.56	3.00	3.06	2.95	3.00
September	6.00	4.56	16.70	3.15	11.13	4.50	3.00	3.49	3.38	2.85
October	6.00	4.52	15.12	3.28	9.60	3.85	3.00	6.13	3.63	2.85
November	6.00	5.87	8.26	3.03	7.19	3.81	3.04	5.75	4.43	2.77
December	6.00	6.12	6.20	2.75	7.00	4.00	3.68	4.32	3.50	2.75
Average	6.00	4.58	11.32	3.45	7.06	5.33	3.42	3.78	3.92	3.04
FOUNDRY										
January	7.00	6.25	7.00	6.38	3.75	8.70	4.75	4.88	7.75	4.50
February	7.00	5.00	7.00	5.63	4.00	8.25	4.88	4.31	8.31	4.31
March	7.00	4.94	7.00	5.45	4.25	8.38	4.88	4.15	4.40	4.40
April	7.00	4.30	10.20	4.75	5.06	7.56	4.75	4.00	4.06	4.06
May	7.00	4.31	13.00	4.50	6.30	6.15	4.69	4.00	4.00	4.00
June	7.00	4.56	15.75	4.45	7.25	5.56	4.38	3.80	4.00	4.00
July	7.00	5.00	17.80	4.06	11.00	5.35	4.10	3.75	4.00	4.00
August	7.00	5.25	18.88	3.75	13.90	5.38	4.00	3.88	4.00	4.00
September	7.00	5.80	17.70	4.15	12.50	5.50	4.00	4.25	4.38	4.00
October	7.00	6.25	16.38	4.38	11.70	4.80	4.00	6.31	4.63	4.00
November	7.00	7.00	9.50	4.19	8.38	4.81	4.06	6.81	5.50	3.85
December	7.00	7.00	7.00	3.81	7.88	4.81	4.55	5.20	4.50	3.75
Average	7.00	5.47	12.27	4.63	8.00	6.27	4.42	4.61	4.96	4.11

[1] Iron Age, Jan. 5, 1928, p. 118.

TABLE 52.—*Average monthly prices of by-product foundry coke, in eight markets, as quoted by Iron Trade Review*

	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
Ashland, Ky. (at ovens):													
1926	(1)	(1)	(1)	(1)	(1)	$8.00	$7.50	$7.50	$7.50	$7.50	$7.50	$8.00	(1)
1927	$8.00	$8.00	$7.50	$7.50	$7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	$7.58
Birmingham, Ala. (at ovens):													
1925	(1)	4.90	5.00	5.00	4.65	4.50	4.50	4.50	4.60	4.75	5.70	5.70	(1)
1926	5.60	5.50	5.50	5.15	5.15	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.45
1927	5.15	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.25	5.00	5.41
Chicago, Ill. (at ovens):													
1921	(1)	(1)	(1)	(1)	(1)	(1)	11.25	11.25	11.25	11.25	11.25	11.25	(1)
1922	11.25	11.25	11.25	11.25	11.25	11.25	11.25	12.60	13.50	13.50	14.70	15.00	12.34
1923	15.00	15.00	15.00	15.00	15.00	15.00	13.50	13.50	13.50	13.50	12.50	12.50	14.08
1924	12.50	12.50	12.50	12.50	12.50	12.50	11.45	10.75	10.75	10.75	10.75	10.75	11.68
1925	10.75	10.75	10.75	10.75	10.75	10.75	9.75	9.75	9.75	10.25	10.45	10.50	10.41
1926	10.50	10.50	10.50	9.95	9.75	9.75	9.75	9.75	9.75	9.75	9.75	10.25	10.00
1927	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.30	9.00	9.65
Indianapolis, Ind. (delivered at consumers' works):													
1925	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	11.25	(1)
1926	11.25	11.25	11.25	10.75	10.75	10.75	10.25	10.25	10.25	10.25	10.25	10.25	10.63
1927	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	9.75	9.75	9.75	9.75	10.08
Newark, N. J. (delivered at consumers' works):													
1921	(1)	(1)	(1)	(1)	(1)	(1)	8.84	8.84	8.84	8.84	8.84	8.84	(1)
1922	8.59	8.59	8.59	8.84	9.49	10.34	11.47	14.04	14.84	14.84	13.28	12.84	11.31
1923	12.84	12.84	12.84	12.84	12.34	11.84	11.34	11.34	11.34	11.41	10.91	10.91	11.90
1924	10.91	10.91	10.91	10.81	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.57
1925	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.71	11.04	11.52	10.58
1926	11.01	11.01	11.01	9.59	9.59	9.59	9.59	9.59	9.59	9.59	10.59	10.59	10.11
1927	9.84	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.61
New England [2] (delivered at consumers' works):													
1921	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	10.66	10.66	10.66	10.66	(1)
1922	10.40	10.25	10.15	10.15	10.15	10.15	14.00	16.30	16.50	16.50	16.20	16.00	13.06
1923	16.00	16.00	16.00	16.00	16.00	15.50	13.50	13.50	13.50	13.50	12.50	12.50	14.54
1924	12.50	12.50	12.50	12.00	12.00	11.30	11.80	11.50	11.50	11.50	11.50	11.50	11.84
1925	11.50	12.00	12.00	12.00	12.00	11.50	11.50	11.65	12.00	12.00	12.90	13.00	12.00
1926	13.00	13.00	13.00	12.50	12.50	12.00	12.00	12.00	12.00	12.00	13.00	13.50	12.54
1927	13.50	12.65	12.50	12.50	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.26
Portsmouth, Ohio (at ovens):													
1926	(1)	(1)	(1)	(1)	(1)	7.50	7.50	7.50	7.50	7.40	7.90	8.00	(1)
1927	8.00	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.54
St. Louis, Mo. (at ovens):													
1921	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	9.50	(1)
1922	9.50	9.50	9.30	9.00	9.00	9.00	9.00	11.40	13.00	14.00	14.00	14.00	10.89
1923	14.00	14.25	14.20	14.00	14.00	14.00	14.00	13.00	13.00	13.00	13.00	13.00	13.62
1924	12.50	12.50	12.50	12.00	12.00	10.60	9.20	9.00	9.00	9.00	9.00	9.00	10.53
1925	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.15	9.50	9.80	10.00	10.00	9.29
1926	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.25	10.50	10.06
1927	10.50	10.50	10.50	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.94

[1] No data. [2] Before July, 1924, reported as "Boston, Mass., delivered at consumers' works."

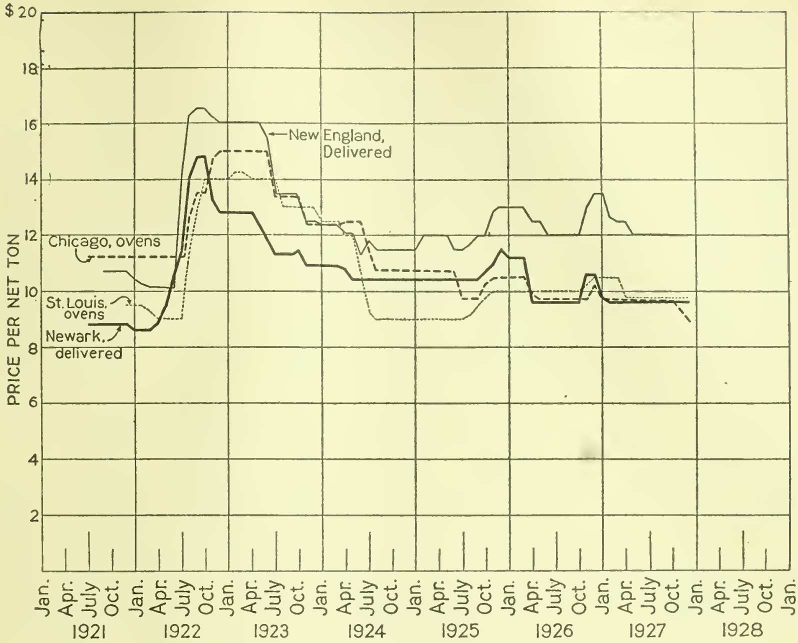

FIGURE 26.—Average monthly price of by-product foundry coke in four markets, 1921-1927, as quoted by Iron Trade Review

EXPORTS AND IMPORTS[14]

TABLE 53.—*Coke exported from the United States, 1909–1927*

Year	Net tons	Value	Year	Net tons	Value
1909	1,002,916	$3,232,673	1919	716,956	$5,128,119
1910	984,618	3,053,293	1920	919,802	9,993,665
1911	1,023,727	3,215,990	1921	306,755	2,760,939
1912	912,576	3,002,742	1922	511,541	4,319,538
1913	987,395	3,309,930	1923	1,237,342	11,889,897
1914	663,585	2,233,686	1924	659,350	4,926,478
1915	895,509	3,092,498	1925	953,812	6,871,962
1916	1,174,645	4,202,236	1926	987,260	6,979,896
1917	1,409,320	8,543,746	1927	806,664	5,430,704
1918	1,687,824	11,861,408			

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[14] Figures on exports and imports, unless otherwise indicated, compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

TABLE 54.—*Coke exported from the United States, 1925–1927, by customs districts*

District	1925		1926		1927	
	Net tons	Value	Net tons	Value	Net tons	Value
Arizona	836	$7,001	837	$7,862	1,317	$10,774
Buffalo	413,811	2,998,980	418,251	3,177,383	320,599	2,099,257
Dakota	41,229	416,826	11,378	91,948	14,801	116,664
Duluth-Superior	11,989	115,869	4,262	38,509	2,704	21,235
El Paso	204	2,362	39	480	52	581
Florida	5,836	47,654	12,393	127,606	13,540	148,594
Los Angeles	4	66	3	20	672	5,934
Maine and New Hampshire	3,380	24,926	3,628	28,415	3,543	26,786
Maryland	17,408	110,216	15,841	109,542	6,352	45,266
Massachusetts	-----	-----	-----	-----	4	54
Michigan	333,384	2,163,113	360,791	2,406,630	309,534	1,986,981
Mobile	4,204	68,596	6,736	116,388	7,820	136,179
New Orleans	5,611	77,869	1,734	15,470	1,681	21,194
New York	5,757	87,614	5,796	62,829	5,884	66,673
Ohio	68,649	403,390	97,096	423,189	73,902	445,927
Philadelphia	1,090	9,225	2,009	13,094	2,801	25,431
Porto Rico	20	354	40	570	67	834
Rochester	424	2,531	90	559	55	341
Sabine	8,518	78,135	3,306	27,500	-----	-----
St. Lawrence	18,647	157,147	16,277	138,377	14,380	101,619
San Antonio	1,089	7,632	582	4,240	456	2,652
San Francisco	69	1,427	205	4,136	68	1,272
South Carolina	416	2,986	245	2,013	-----	-----
Vermont	10,923	84,839	14,726	114,435	12,928	99,478
Virginia	-----	-----	9,080	56,967	4,280	21,118
Washington	314	3,204	1,915	11,734	9,224	45,860
	953,812	6,871,962	987,260	6,979,896	806,664	5,430,704

TABLE 55.—*Coke exported from the United States, 1925–1927, by countries of destination*

Destination	1925		1926		1927	
	Net tons	Value	Net tons	Value	Net tons	Value
Africa (British West)	-----	-----	3	$57	3	$68
Argentina	-----	-----	840	9,221	-----	-----
Australia	32	$203	-----	-----	-----	-----
Austria	-----	-----	560	10,000	-----	-----
Barbados	-----	-----	6	85	-----	-----
Brazil	28	419	1,867	20,457	39	623
British Honduras	-----	-----	-----	-----	1	10
Canada	902,688	6,370,289	932,645	6,459,748	764,096	4,960,696
Chile	17,413	110,531	13,157	83,209	7,896	54,103
Colombia	199	3,342	221	3,830	97	1,678
Costa Rica	84	1,560	36	628	66	1,408
Cuba	6,906	58,522	13,733	139,717	15,835	162,068
Dominican Republic	336	4,348	96	1,284	119	1,537
Ecuador	73	1,551	46	403	83	1,346
France	3,282	52,148	4,900	63,406	4,947	82,340
French Oceania	1	12	-----	-----	2	40
Germany	5,605	63,000	3,200	36,364	2,775	42,305
Greenland	-----	-----	32	250	-----	-----
Guatemala	115	1,665	85	1,520	63	1,037
Haiti	25	420	28	420	44	343
Honduras	78	1,056	85	1,366	72	1,106
Italy	569	10,160	1,414	25,080	896	16,000
Jamaica	4	100	-----	-----	-----	-----
Mexico	3,900	32,502	1,805	16,650	3,174	28,077
Netherlands	4,885	86,793	3,413	38,091	1,148	20,000
Netherland West Indies	-----	-----	6	65	10	114
Newfoundland and Labrador	81	1,471	-----	-----	-----	-----
Nicaragua	47	743	29	520	28	503
Norway	6,107	52,206	370	2,554	1,209	11,733
Other British West Indies	267	1,825	13	336	13	158
Panama	312	3,530	91	1,620	176	3,298
Paraguay	27	432	28	504	-----	-----
Peru	-----	-----	142	2,543	1,868	11,262
Philippine Islands	-----	-----	148	2,882	-----	-----
Portugal	-----	-----	259	1,552	-----	-----
Salvador	55	1,036	57	1,222	38	655
Spain	-----	-----	30	525	-----	-----
Trinidad and Tobago	17	156	10	154	6	60
United Kingdom	564	10,000	675	12,061	1,734	24,506
Uruguay	-----	-----	4,860	21,656	-----	-----
Venezuela	111	1,924	2,368	19,889	225	3,618
Virgin Islands of the United States	1	18	2	27	1	12
	953,812	6,871,962	987,260	6,979,896	806,664	5,430,704

TABLE 56.—*Coke exported from the United States, 1925–1927, by months*

Month	1925		1926		1927	
	Net tons	Value	Net tons	Value	Net tons	Value
January	70, 386	$526, 068	91, 687	$746, 178	66, 608	$488, 437
February	68, 466	535, 014	75, 821	634, 893	66, 084	486, 946
March	73, 898	499, 462	97, 280	775, 138	52, 010	394, 948
April	59, 157	429, 449	61, 501	435, 745	55, 495	376, 163
May	65, 673	435, 001	89, 895	577, 119	56, 531	379, 721
June	56, 542	357, 809	85, 626	572, 049	65, 897	425, 232
July	71, 175	455, 069	91, 150	553, 096	65, 004	390, 342
August	71, 360	482, 403	84, 320	524, 081	61, 925	410, 372
September	94, 030	614, 193	72, 160	514, 944	85, 101	567, 065
October	79, 075	550, 223	94, 554	577, 013	77, 361	504, 224
November	96, 937	797, 238	75, 199	562, 990	84, 272	560, 811
December	147, 113	1, 190, 033	68, 067	506, 650	70, 376	446, 443
	953, 812	6, 871, 962	987, 260	6, 979, 896	806, 664	5, 430, 704

TABLE 57.—*Coke imported for consumption in the United States, 1909–1927*

Year	Net tons	Value	Year	Net tons	Value
1909	191, 253	$736, 120	1919	16, 486	$140, 653
1910	172, 716	625, 130	1920	41, 143	403, 175
1911	77, 923	254, 455	1921	30, 990	336, 394
1912	123, 614	488, 398	1922	94, 228	802, 987
1913	101, 212	435, 157	1923	85, 002	862, 596
1914	133, 226	551, 104	1924	82, 833	795, 477
1915	53, 222	222, 382	1925	201, 579	1, 609, 474
1916	54, 955	249, 514	1926	284, 548	2, 174, 350
1917	24, 872	146, 451	1927	168, 859	1, 371, 568
1918	30, 168	221, 880			

TABLE 58.—*Coke imported into the United States, 1925–1927, by customs districts*

District	1925		1926		1927	
	Net tons	Value	Net tons	Value	Net tons	Value
Buffalo	22, 429	$462, 772	21, 754	$472, 228	22, 658	$367, 699
Connecticut			4, 814	22, 145		
Dakota	20	122				
Hawaii	581	3, 542			562	2, 535
Los Angeles	22, 478	135, 521	17, 356	105, 830	22, 859	136, 272
Maine and New Hampshire	5, 605	28, 147	19, 615	118, 578	386	2, 865
Massachusetts	25, 679	169, 334	43, 712	262, 409		
Michigan	27	201	10, 316	73, 831	50, 225	427, 819
Montana and Idaho	24, 900	209, 123	27, 892	223, 506	24, 828	178, 835
New York	43, 166	260, 681	62, 844	494, 391	36	645
Ohio	1	7			37	103
Oregon	3, 228	17, 075	4, 085	22, 574	4, 395	22, 853
Porto Rico					10	140
Rhode Island	3, 530	14, 573	16, 659	99, 922	4, 477	21, 850
St. Lawrence	2, 759	31, 316	360	3, 593	69	572
San Antonio			32	323	713	6, 466
San Francisco	38, 070	225, 488	45, 815	224, 331	30, 019	158, 329
Vermont	460	2, 942	502	4, 208	512	4, 323
Washington	8, 646	48, 630	8, 792	46, 481	7, 073	40, 262
	201, 579	1, 609, 474	284, 548	2, 174, 350	168, 859	1, 371, 568

TABLE 59.—*Coke imported into the United States, 1925–1927, by countries*

Country	1925		1926		1927	
	Net tons	Value	Net tons	Value	Net tons	Value
Belgium	4, 397	$20, 844	8, 501	$35, 593	840	$4, 435
Canada	52, 182	716, 251	62, 177	785, 173	99, 267	985, 868
Germany	15, 447	95, 180	60, 104	315, 603	41, 079	213, 100
Mexico			32	323	713	6, 466
Netherlands	17, 197	134, 022	58, 243	479, 343	6, 550	56, 762
Sweden	112	1, 577				
United Kingdom	112, 244	641, 600	95, 491	558, 315	20, 400	104, 797
West Indies ("Other British")					10	140
	201, 579	1, 609, 474	284, 548	2, 174, 350	168, 859	1, 371, 568

SHIPMENTS BY RAIL AND WATER

Tables 60 to 63, which follow, show the quantity of by-product and beehive coke shipped by originating railroads and waterways. They are compiled from reports of the coke operators and therefore may not always agree with the records of the carriers themselves. In the by-product industry a large part of the coke produced is consumed close to the ovens and is not loaded for shipment. In 1927 shipments of by-product coke amounted to only 41.3 per cent of production. (Table 60.) The beehive ovens, on the other hand, are usually situated at the mines, and the great bulk of the beehive coke produced must be transported some distance to reach the place of use. Table 62 indicates that in 1927, for the country as a whole, 94.6 per cent of the beehive coke produced was loaded for shipment.

In some localities, however, the furnaces that consume beehive coke are also located at the mines, and considerable quantities of the coke produced are used locally without appearing as railroad shipments. This fact is notable in the Birmingham district.

Water-borne shipments of beehive coke are practically confined to the Monongahela River, down which a comparatively small tonnage is transported from the Connellsville field to the Pittsburgh district. By-product coke moves in small quantities over several water routes, the most important being Chesapeake Bay and the Hackensack, Hudson, and Monongahela Rivers.

TABLE 60.—*By-product coke loaded for shipment on originating railroads and waterways in the United States in 1927, by States, as reported by the coke producers*

State	Originating railroad or waterway	Shipments (net tons)	Production (net tons)	Per cent of State production shipped
	RAILROADS			
Alabama	Birmingham Southern; Illinois Central; Louisville & Nashville; St. Louis-San Francisco; Seaboard Air Line; Southern.	1, 223, 213	4, 364, 354	28. 0
Colorado	Colorado & Wyoming	432	594, 402	. 1
Illinois	Alton & Southern; Belt Railway of Chicago; Chicago & Illinois Western; Chicago Short Line; Elgin, Joliet & Eastern; Terminal Railroad Association.	2, 182, 686	3, 013, 940	72. 4
Indiana	Cleveland, Cincinnati, Chicago & St. Louis; Chicago, Milwaukee, St. Paul & Pacific; Elgin, Joliet & Eastern; Pennsylvania; Wabash.	1, 956, 228	5, 549, 762	35. 2
Maryland	Pennsylvania	2, 350	1, 077, 309	. 2
Massachusetts	Boston & Albany; Boston & Maine	311, 000	744, 091	41. 8
Michigan	Delray Connecting; Detroit Terminal; Detroit, Toledo & Ironton; Michigan Central; New York Central.	1, 165, 666	1, 920, 394	60. 7
Minnesota	Duluth, Missabe & Northern; Great Northern; Northern Pacific.	304, 658	632, 628	48. 2
New Jersey	Delaware, Lackawanna & Western; Erie; Pennsylvania; Philadelphia & Reading.	111, 632	906, 321	12. 3
New York	Delaware, Lackawanna & Western; Lehigh Valley; New York Central; South Buffalo.	1, 135, 008	3, 602, 642	31. 5
Ohio	Baltimore & Ohio; Erie; Fairport, Painesville & Eastern; Newburgh & South Shore; New York Central; Nickel Plate; Norfolk & Western; Pennsylvania; River Terminal; Toledo Terminal; Wheeling & Lake Erie.	1, 254, 824	7, 213, 619	17. 4
Pennsylvania	Conemaugh & Black Lick; Lehigh Valley; Pennsylvania; Philadelphia & Reading; Union; Upper Merion & Plymouth.	5, 101, 168	11, 061, 084	46. 1

TABLE 60.—*By-product coke loaded for shipment on originating railroads and waterways in the United States in 1927, by States, as reported by the coke producers*—Continued

State	Originating railroad or waterway	Shipments (net tons)	Production (net tons)	Per cent of State production shipped
	RAILROADS—continued			
Tennessee	Central of Georgia; Clinchfield; Southern.	74,319	122,312	60.8
Utah	Denver & Rio Grande Western; Union Pacific.	82,771	197,183	42.0
Washington	Northern Pacific	4,749	40,570	11.7
West Virginia	Baltimore & Ohio; Pennsylvania	452,786	1,396,285	32.4
Kentucky, Missouri, Rhode Island, and Wisconsin.	Chesapeake & Ohio; Chicago & Northwestern; Chicago, Milwaukee, St. Paul & Pacific; Minneapolis, St. Paul & Sault Ste. Marie; Missouri Pacific; New York, New Haven & Hartford.	1,232,128	1,447,830	85.1
	Total railroad shipments	16,595,618		
	WATERWAYS			
Maryland	Chesapeake Bay	101,500	(1)	9.4
Massachusetts, New York, and Pennsylvania.	Boston Harbor; East River; Hudson River; Monongahela River.	900,982	(1)	5.8
Michigan and Wisconsin	Detroit River; Lake Michigan	29,526	(1)	(2)
New Jersey	Delaware River; Hackensack River	517,201	(1)	57.1
	Total waterway shipments	1,549,209		
	Grand total	18,144,827	43,884,726	41.3

[1] Figures given under respective States above.

[2] Not at liberty to publish.

TABLE 61.—*Alphabetical list of railroads and waterways on which by-product coke was loaded for shipment in 1927, as reported by the coke producers*

Railroad or waterway	State in which coke was loaded for shipment
RAILROADS	
Alton & Southern	Illinois.
Baltimore & Ohio	Ohio and West Virginia.
Belt Railway of Chicago	Illinois.
Birmingham Southern	Alabama.
Boston & Albany	Massachusetts.
Boston & Maine	Do.
Central of Georgia	Tennessee.
Chesapeake & Ohio	Kentucky.
Chicago & Illinois Western	Illinois.
Chicago & Northwestern	Wisconsin.
Chicago, Milwaukee, St. Paul & Pacific.	Indiana and Wisconsin.
Chicago Short Line	Illinois.
Cleveland, Cincinnati, Chicago & St. Louis.	Indiana.
Clinchfield	Tennessee.
Colorado & Wyoming	Colorado.
Conemaugh & Black Lick	Pennsylvania.
Delaware, Lackawanna & Western.	New Jersey and New York.
Delray Connecting	Michigan.
Denver & Rio Grande Western.	Utah.
Detroit Terminal	Michigan.
Detroit, Toledo & Ironton	Do.
Duluth, Missabe & Northern.	Minnesota.
Elgin, Joliet & Eastern	Illinois and Indiana.
Erie	New Jersey and Ohio.
Fairport, Painesville & Eastern.	Ohio.
Great Northern	Minnesota.
Illinois Central	Alabama.
Lehigh Valley	New York and Pennsylvania.
Louisville & Nashville	Alabama.
Michigan Central	Michigan.
Minneapolis, St. Paul & Sault Ste. Marie.	Wisconsin.
Missouri Pacific	Missouri.
RAILROADS—continued	
Newburgh & South Shore	Ohio.
New York Central	Michigan, New York, and Ohio.
New York, New Haven & Hartford.	Rhode Island.
Nickel Plate	Ohio.
Norfolk & Western	Do.
Northern Pacific	Minnesota and Washington.
Pennsylvania	Indiana, Maryland, New Jersey, Ohio, Pennsylvania, and West Virginia.
Philadelphia & Reading	New Jersey and Pennsylvania.
River Terminal	Ohio.
St. Louis-San Francisco	Alabama.
Seaboard Air Line	Do.
South Buffalo	New York.
Southern	Alabama and Tennessee.
Terminal Railroad Association.	Illinois.
Toledo Terminal	Ohio.
Union	Pennsylvania.
Union Pacific	Utah.
Upper Merion & Plymouth	Pennsylvania.
Wabash	Indiana.
Wheeling & Lake Erie	Ohio.
WATERWAYS	
Boston Harbor	Massachusetts.
Chesapeake Bay	Maryland.
Delaware River	New Jersey.
Detroit River	Michigan.
East River	New York.
Hackensack River	New Jersey.
Hudson River	New York.
Lake Michigan	Wisconsin.
Monongahela River	Pennsylvania.

TABLE 62.—*Beehive coke loaded for shipment on originating railroads and waterways in the United States in 1927, by States, as reported by the coke producers*

State	Originating railroad or waterway	Shipments (net tons)	Production (net tons)	Per cent of State production shipped
	RAILROADS			
Colorado	Colorado & Wyoming; Denver & Rio Grande Western.	183,742	194,184	94.6
Ohio			(1)	
Pennsylvania	Baltimore & Ohio; Buffalo, Rochester & Pittsburgh; Ligonier Valley; Monongahela; Pennsylvania; Pittsburgh & Lake Erie; Washington Run.	5,256,737	5,716,207	92.0
Tennessee	Nashville, Chattanooga & St. Louis; Southern	41,124	104,808	39.2
Utah	Denver & Rio Grande Western	84,865	84,865	100.0
Virginia	Interstate; Louisville & Nashville; Norfolk & Western.	318,762	316,754	[2] 100.6
Washington	Northern Pacific	30,701	30,701	100.0
West Virginia	Baltimore & Ohio; Chesapeake & Ohio; New York Central; Norfolk & Western; Western Maryland.	526,329	527,142	99.8
Georgia and Kentucky.	Central of Georgia; Louisville & Nashville	97,390	[1] 232,756	41.8
	Total railroad shipments	6,539,650		
	WATERWAYS			
Pennsylvania	Monongahela River	281,543	(3)	4.9
	Grand total	6,821,193	7,207,417	94.6

[1] Ohio included with Georgia and Kentucky.

[2] Excess of shipments over production represents inclusion of screenings or withdrawal from stock.

[3] Figures given under Pennsylvania above.

TABLE 63.—*Alphabetical list of railroads and waterways on which beehive coke was loaded for shipment in 1927, as reported by the coke producers*

Railroad or waterway	State in which coke was loaded for shipment
RAILROADS	
Baltimore & Ohio	Pennsylvania and West Virginia.
Buffalo, Rochester & Pittsburgh.	Pennsylvania.
Central of Georgia	Georgia.
Chesapeake & Ohio	West Virginia.
Colorado & Wyoming	Colorado.
Denver & Rio Grande Western.	Colorado and Utah.
Interstate	Virginia.
Ligonier Valley	Pennsylvania.
Louisville & Nashville	Kentucky and Virginia.
Monongahela	Pennsylvania.
Nashville, Chattanooga & St. Louis.	Tennessee.
RAILROADS—continued	
New York Central	West Virginia.
Norfolk & Western	Virginia and West Virginia.
Northern Pacific	Washington.
Pennsylvania	Pennsylvania.
Pittsburgh & Lake Erie	Do.
Southern	Tennessee.
Washington Run	Pennsylvania.
Western Maryland	West Virginia.
WATERWAYS	
Monongahela River	Pennsylvania.

WORLD PRODUCTION

The world production of metallurgical coke in 1927 was approximately 118,000,000 metric tons, an increase of 9 per cent when compared with 1926. (Table 64.) The decrease in the United States was offset by a sharp increase in other principal producing countries. After the British coal miners' strike was settled production of coke in the United Kingdom recovered to a level halfway between that of 1924 and of 1925. Production also increased in Germany, Belgium, Poland, Czechoslovakia, France, and Russia.

TABLE 64.—*Coke produced in the principal countries of the world, 1923–1927, in metric tons* [1]

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1923	1924	1925	1926	1927
Australia:					
New South Wales	589, 689	573, 420	619, 199	607, 255	720, 727
Queensland	5, 330	7, 230	5, 470	6, 290	4, 263
Belgium	4, 179, 964	4, 216, 580	4, 111, 771	4, 916, 683	5, 696, 980
Bulgaria	----------	----------	1, 193	1, 582	1, 448
Canada	1, 037, 985	833, 691	959, 438	1, 329, 314	1, 366, 623
China (exports)	29, 795	27, 606	[2] 19, 217	14, 551	12, 989
Chosen	100, 907	105, 585	107, 574	119, 338	130, 356
Czechoslovakia	1, 809, 598	2, 220, 556	2, 015, 968	1, 961, 762	2, 428, 584
France	4, 287, 109	5, 367, 415	6, 024, 700	6, 908, 000	(3)
Germany [4]	14, 203, 569	25, 100, 888	28, 669, 631	27, 552, 668	32, 522, 920
Great Britain [5]	13, 633, 678	12, 958, 049	11, 185, 375	4, 790, 420	12, 027, 121
India, British [6]	307, 764	371, 944	478, 753	554, 045	661, 506
Italy	275, 235	309, 971	512, 264	591, 528	578, 445
Japan:					
Japan proper	658, 053	832, 429	849, 202	1, 035, 409	1, 086, 023
Taiwan	(3)	(3)	13, 409	[7] 15, 602	(3)
Netherlands	671, 687	975, 779	1, 143, 806	1, 198, 609	1, 478, 822
Peru	45, 000	20, 000	(3)	25, 960	(3)
Poland	1, 376, 194	949, 758	963, 964	1, 114, 571	1, 402, 008
Rhodesia, Southern	122, 897	137, 078	138, 339	153, 069	146, 966
Russia [8]	(3)	723, 800	1, 350, 300	2, 761, 353	3, 415, 417
Spain	651, 966	724, 082	861, 130	693, 739	714, 243
Sweden	114, 200	79, 328	77, 369	112, 542	115, 756
Union of South Africa	53, 926	67, 561	67, 829	80, 312	98, 249
United States	51, 688, 879	40, 160, 500	46, 508. 345	51, 587, 278	46, 349, 770
	96, 056, 000	96, 776, 000	106, 704, 000	108, 132, 000	118, 000, 000

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[1] Gas-house coke is not included.

[2] Production in 1925 is estimated at 695,535 tons (Hsieh, C. Y., General Statement on the Mining Industry. China, Geol. Surv. Spec. Rept. No. 2, Peking, 1926). Similar figures for other years are not available.

[3] Estimate included in total.

[4] Includes the Saar.

[5] In Great Gritain the production of gas-house coke (including breeze), not included above, is especially important and was as follows: 1923, 11,692,948 tons; 1924, 12,279,666; 1925, 12,022,759; 1926, 11,784,401; 1927, 12,562,447.

[6] Figures represent only coke made at collieries.

[7] Includes a small quantity of gas-house coke.

[8] Year ended Sept. 30.

COKE-OVEN BY-PRODUCTS

SUMMARY TABLES

The output of by-products in 1927 reflects the large production of by-product coke. The total receipts from the sale of by-products (excluding breeze and screenings) amounted to $138,903,882 in 1927, a slight increase when compared with the previous high mark established in 1926. Table 65 summarizes the by-products of coke-oven operation in 1926 and 1927.

TABLE 65.—*By-products obtained from coke-oven operations in the United States, 1926–27*

[Exclusive of screenings and breeze]

Product	Production	Sales		
		Quantity	Value	
			Total	Average
1926				
Tar ... gallons	529,486,374	277,248,522	$14,103,760	$0.051
Ammonia:				
Sulphate ... pounds	1,167,859,453	1,152,141,717	24,658,031	.021
Ammonia liquor (NH_3 content) ... do	53,523,229	53,448,034	3,470,172	.065
	-----	-----	28,128,203	-----
Sulphate equivalent of all forms ... do	1,381,952,369	1,365,933,853	-----	-----
Gas:				
Used under boilers, etc ... M cubic feet	[1] 706,681,828	25,953,876	1,438,699	.055
Used in steel or affiliated plants ... do		249,840,649	27,955,574	.112
Distributed through city mains ... do		89,565,953	29,978,997	.335
Sold for industrial use ... do		32,553,610	5,313,530	.163
	-----	397,914,088	64,686,800	.163
Light oil and derivatives:				
Crude light oil ... gallons	[2] 164,059,552	10,783,568	1,330,208	.123
Benzol, crude ... do	4,744,713	4,660,621	1,109,974	.238
Benzol, refined ... do	17,713,904	17,327,169	3,957,719	.228
Motor benzol ... do	90,029,972	89,501,212	16,863,109	.188
Toluol, crude ... do	432,317	400,308	127,298	.318
Toluol, refined ... do	8,359,135	8,250,297	2,787,454	.338
Solvent naphtha ... do	4,704,555	3,546,117	1,035,870	.292
Other light-oil products ... do	4,127,710	1,324,303	93,344	.070
	[3] 130,112,306	135,793,595	27,304,976	.201
Naphthalene:				
Crude ... pounds	7,746,821	7,556,372	96,210	.013
Refined ... do	139,701	166,851	1,100	([4])
	7,886,522	7,723,223	97,310	.013
Other products	-----	-----	148,720	-----
Value of all by-products sold	-----	-----	134,469,769	-----
1927				
Tar ... gallons	546,859,205	305,898,176	16,095,478	.053
Ammonia:				
Sulphate ... pounds	1,216,141,460	1,267,753,969	24,802,926	.020
Ammonia liquor (NH_3 content) ... do	54,694,723	53,994,327	2,580,342	.048
	-----	-----	27,383,268	-----
Sulphate equivalent of all forms ... do	1,434,920,352	1,483,731,277	-----	-----
Gas:				
Used under boilers, etc ... M cubic feet	[1] 700,894,799	25,848,762	1,866,342	.072
Used in steel or affiliated plants ... do		244,969,339	26,580,340	.109
Distributed through city mains ... do		106,910,108	36,249,081	.339
Sold for industrial use ... do		30,661,148	5,396,405	.176
	-----	408,389,357	70,092,168	.172
Light oil and derivatives:				
Crude light oil ... gallons	[2] 164,488,233	9,265,948	1,077,957	.116
Benzol, crude and refined ... do	22,007,760	21,193,807	4,371,519	.206
Motor benzol ... do	86,995,343	86,802,745	14,629,999	.169
Toluol, crude and refined ... do	12,093,590	11,784,984	3,999,820	.339
Solvent naphtha ... do	4,979,736	3,661,970	926,787	.253
Other light-oil products ... do	3,155,031	1,393,876	147,017	.105
	[3] 129,231,460	134,103,330	25,153,099	.188
Naphthalene, crude ... pounds	8,302,845	7,848,224	86,078	.011
Other products	-----	-----	93,791	-----
Value of all by-products sold	-----	-----	138,903,882	-----

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[1] Includes gas wasted and gas used for heating retorts.
[2] Refined on the premises to make the derived products shown: 1926, 159,589,756 gallons of crude oil; 1927, 161,072,729 gallons.
[3] Total gallons of derived products.
[4] Quantity sold too small to be representative.

The average receipts from the sale of each by-product per ton of coke produced are shown in Table 66 and Figure 27. Before the World War benzol products (light oil, benzol, toluol, solvent naphtha, etc.) were recovered by only one company. The demand for benzol in munitions manufacture caused all companies hastily to install recovery apparatus, and the benzols rose in 1916 to a value of $1.58 per ton of coke. Even after the collapse of the inflated price of toluol following the armistice the benzol group still furnishes a large credit to the coking operation, the gross value of the sales in 1926 amounting to 62 cents per ton of coke. Receipts from the sales of ammonia have also declined since the war, reflecting the competition of atmospheric nitrogen. The decline in prices of the benzols and ammonia has affected all countries, but in the United States it has been offset by higher values of tar and gas. The gross value of the tar recovered per ton of coke has more than doubled since 1913, and the value of the surplus gas not used for heating the ovens has risen from 45 cents to $1.60 per ton of coke. This remarkable increase in the value of the gas has resulted from a number of causes, including

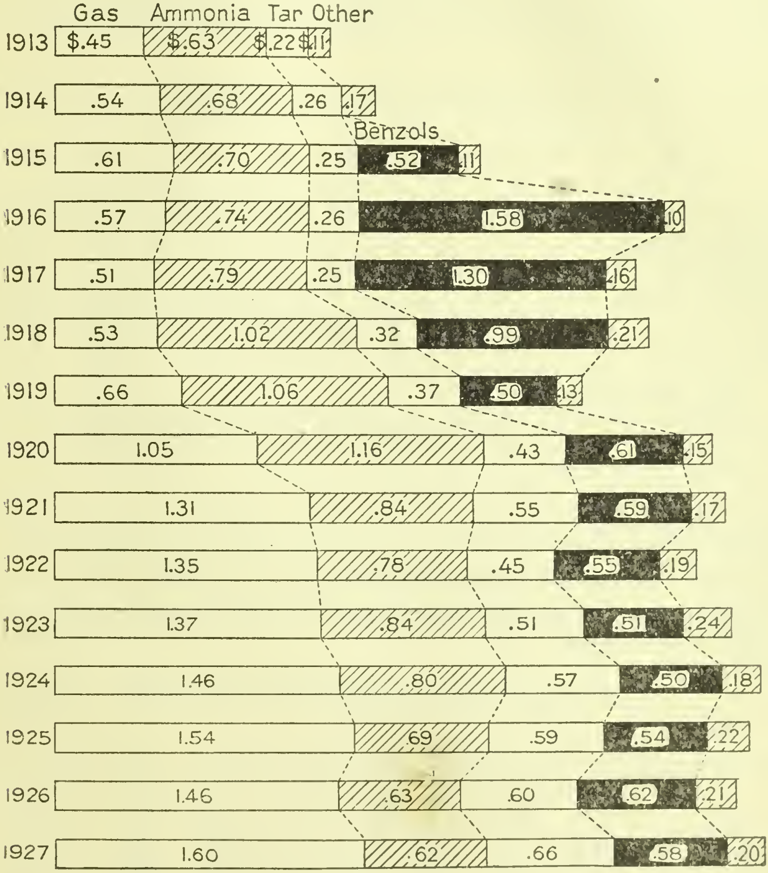

FIGURE 27.—Value of the several by-products per ton of coke produced, 1913–1927

reduction in the percentage required for heating the ovens, increased sales of gas for city supply, and—not the least important—higher prices of industrial gas which have attended the restricted supply of natural gas in the Eastern States. The influence of the last factor is suggested by the sharp advance in the average price of natural gas sold in Ohio, which rose from 21.1 cents per M cubic feet in 1913 and 22.1 cents in 1916 to 57.1 cents in 1927. Increases in the value of tar and gas have more than offset a decline in the value of the benzols and ammonia, and the gross value of all the by-products reckoned per ton of coke is now much higher than before the war.

The average receipts per unit of the by-products sold are shown in Table 67 and Figure 28.

TABLE 66.—*Value of by-products and of coke, including breeze, per ton of coke produced in the United States, 1918–1927*

Product	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Ammonia and its compounds	$1.02	$1.06	$1.16	$0.84	$0.78	$0.84	$0.80	$0.69	$0.63	$0.62
Light oil and its derivatives (including naphthalene)	.99	.50	.61	.59	.55	.51	.50	.54	.62	.58
Surplus gas sold or used	.53	.66	1.05	1.31	1.35	1.37	1.46	1.54	1.46	1.60
Tar sold	.24	.28	.21	.29	.22	.25	.28	.30	.32	.37
Miscellaneous products	.09	.03	.01	.01	.01	.01	------	------	------	------
Tar used	2.87	2.53	3.04	3.04	2.91	2.98	3.04	3.07	3.03	3.17
	.08	.09	.22	.26	.23	.26	.29	.29	.28	.29
Breeze produced	.12	.10	.14	.16	.18	.24	.18	.22	.21	.20
Total value of by-products, including those not sold	3.07	2.72	3.40	3.46	3.32	3.48	3.51	3.58	3.52	3.66
Value of coke produced	[1] 7.42	[1] 6.37	[1] 10.15	[1] 5.95	[1] 6.59	[1] 6.85	[1] 5.76	[1] 5.28	[1] 5.65	[1] 5.29
Total value of coke and by-products	10.49	9.09	13.55	9.41	9.91	10.33	9.27	8.86	9.17	8.95

[1] The average receipts per ton of coke sold during these years were $7.88 in 1918, $6.58 in 1919, $10.77 in 1920, $7.72 in 1921, $8.45 in 1922, $8.53 in 1923, $6.90 in 1924, $6.61 in 1925, $6.95 in 1926, and $6.57 in 1927.

TABLE 67.—*Average receipts per unit of coke-oven by-products sold, 1913–1927*

[The figures in this table for 1913 to 1917 represent "average value of by-products produced and sold." For 1918 to 1927 they represent "average receipts from sales." The two sets of figures are probably comparable for practical purposes]

	Tar	Sulphate	Surplus gas	Benzol, refined	Motor benzol	Toluol, refined	Solvent naphtha	Naphthalene	
								Crude	Refined
Unit	Gallon	Pound	M cubic feet	Gallon	Gallon	Gallon	Gallon	Pound	Pound
	Cents	*Cents*	*Cents*	*Cents*	*Cents*		*Cents*	*Cents*	
1913	2.5	3.1	8.8	[1] 27	(2)	[1] $0.29	[1] 25	(2)	
1914	2.6	2.8	9.8	[1] 26	(2)	[1] .33	[1] 25	(2)	
1915	2.6	2.8	10.2	56.8	(3)	2.45	24	[4] 10.0	
1916	2.6	3.1	9.8	62.4	(3)	2.85	28.4	[4] 3.4	
1917	2.7	3.4	8.7	45.0	(3)	1.37	16.6	[4] 3.3	
1918	3.2	4.5	8.7	27.5	(3)	1.43	14.1	2.8	6.6
1919	3.2	3.8	8.6	20.6	(5)	.263	15.2	2.0	4.1
1920	3.7	4.3	14.0	26.0	22.7	.300	18.1	2.7	6.1
1921	4.2	2.5	16.8	23.9	17.9	.283	17.7	2.5	5.6
1922	4.0	2.5	16.7	28.5	19.1	.292	18.8	1.6	5.0
1923	4.4	2.9	16.2	24.8	16.3	.291	17.9	1.7	5.5
1924	4.6	2.4	16.5	20.9	15.2	.241	18.7	1.5	3.6
1925	4.9	2.3	17.0	22.4	16.6	.261	20.2	1.0	2.5
1926	5.1	2.1	16.3	22.8	18.8	.338	29.2	1.3	(6)
1927	5.3	2.0	17.2	[7] 20.6	16.9	.340	25.3	1.1	--------

[1] Trade quotations, New York market; used to avoid disclosing individual operators' reports.
[2] No data.
[3] Not reported during the war.
[4] Crude and refined, not separated prior to 1918.
[5] Data uncertain.
[6] Sales too small to be representative.
[7] Crude and refined, not separated.

The trend of the average recovery of the principal by-products per ton of coal charged is the subject of Table 68 and Figure 29. From 1915 to 1921 the average yields of tar, light oil, and ammonia increased notably, but since 1921 they have shown no great change. The quantity of surplus gas per ton of coal carbonized has continued to increase, a fact that helps to explain the increasing credits from

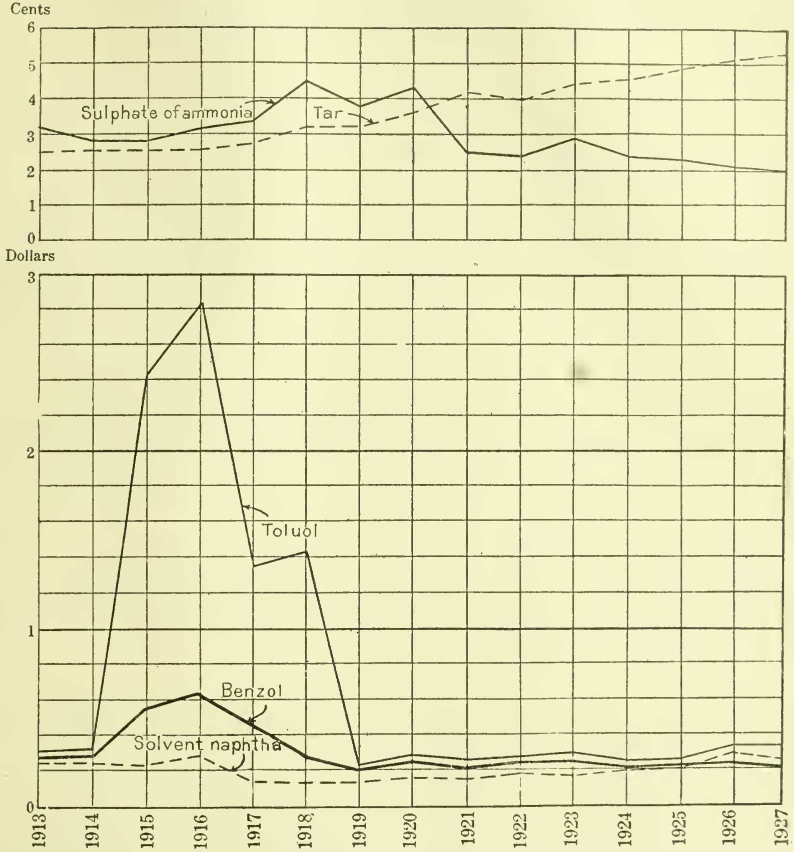

FIGURE 28.—Average receipts per unit of principal refined light oils and other by-products, 1913–1927

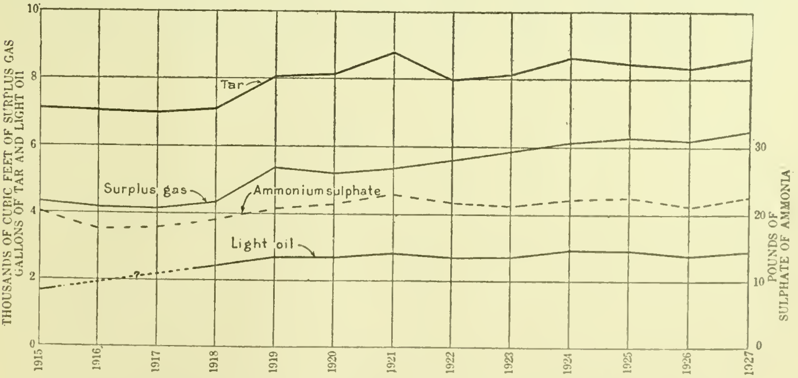

FIGURE 29.—Average yield of by-products per net ton of coal charged, 1915–1927

gas per ton of coke shown by Figure 27. All four of the principal by-products show higher yields in 1927 than in 1926.

TABLE 68.—*Average yield of coke and by-products per net ton of coal charged in by-product ovens in the United States, 1919–1927*

Product	1919	1920	1921	1922	1923	1924	1925	1926	1927
Coke pounds	1,402	1,395	1,376	1,390	1,386	1,386	1,398	1,394	1,388
Tar gallons	8.1	8.2	8.8	8.0	8.1	8.6	8.4	8.3	8.6
Ammonium sulphate (or equivalent) pounds	20.8	21.4	22.8	21.9	21.2	22.2	22.4	21.7	22.7
Light oil gallons	2.7	[1] 2.7	[1] 2.8	[1] 2.7	[1] 2.7	[1] 2.9	[1] 2.9	[1] 2.8	[1] 2.9
Gas:									
Total M cubic feet	11.6	10.8	10.8	10.8	11.1	11.0	11.2	11.1	11.1
Surplus sold or used do	5.4	5.2	5.4	5.6	5.9	6.1	6.3	6.2	6.5
Burned in coking process do	5.9	5.4	5.1	5.0	5.0	4.7	4.7	4.7	4.4
Wasted do	.3	.2	.3	.2	.2	.2	.2	.2	.2

[1] Average for plants recovering light oil.

TABLE 69.—*Coal equivalent of the by-products of by-product coking, 1914–1927*

Year	Quantity of by-products				Rough equivalent in heating value (billion B. t. u.)					Coal equivalent	
	1	2	3	4	5	6	7	8	9	10	11
	Coke breeze (thousand net tons)	Surplus gas (billion cubic feet)	Tar produced (thousand gallons)	Light oil produced (thousand gallons)	Coke breeze (1×20)	Surplus gas (2×550)	Tar (3× 0.150)	Light oil (4× 0.130)	Total (5+6+7+8)	Net tons (9÷0.0262)	Per cent which this forms of coal made into coke
1914	667	61	109,901	8,464	13,340	33,550	16,485	1,100	64,475	2,461,000	4.8
1915	841	84	138,415	16,601	16,820	46,200	20,762	2,158	85,940	3,280,000	5.3
1916	1,031	110	185,506	43,710	20,620	60,500	27,826	5,682	114,628	4,375,000	5.4
1917	1,496	131	221,999	54,387	29,920	72,050	33,300	7,070	142,340	5,432,000	6.5
1918	1,999	158	263,299	87,562	39,980	86,900	39,495	11,383	177,758	6,785,000	8.0
1919	1,849	193	288,902	92,473	36,980	106,150	43,335	12,021	198,486	7,575,000	11.5
1920	2,461	230	360,664	109,710	49,220	126,500	54,100	14,262	244,082	9,316,000	12.2
1921	1,831	154	253,052	76,917	36,620	84,700	37,958	9,999	169,277	6,461,000	17.4
1922	2,395	231	327,780	101,438	47,900	127,050	49,167	13,187	237,304	9,058,000	16.7
1923	3,333	318	440,907	135,647	66,660	174,900	66,136	17,634	325,330	12,417,000	14.7
1924	2,951	301	422,074	128,957	59,020	165,550	63,311	16,764	304,645	11,628,000	17.9
1925	3,546	362	480,849	146,443	70,920	199,100	72,127	19,038	361,185	13,786,000	18.5
1926	4,183	398	529,486	164,060	83,660	218,900	79,423	21,328	403,311	15,394,000	18.6
1927	4,100	408	546,859	164,488	82,000	224,400	82,029	21,383	409,812	15,642,000	21.0

TAR

TABLE 70.—*Coke-oven tar produced and sold in the United States in 1927, by States*

State	Produced (gallons)		Sold			Used (gallons)			On hand Dec. 31 (gallons)
	Total	Per ton of coal coked	Gallons	Value		As fuel under boilers	In open-hearth or affiliated plants	Otherwise	
				Total	Average				
Alabama	56, 020, 600	9. 0	35, 215, 252	$1, 889, 797	$0. 054	(1)	(1)	280, 297	2, 018, 052
Colorado	9, 130, 000	10. 5	--------	--------	-----	--------	9, 168, 576	20, 372	93, 064
Illinois	36, 177, 143	8. 3	30, 804, 294	1, 542, 605	. 050	--------	(1)	60, 182	1, 653, 761
Indiana	45, 306, 415	6. 1	22, 546, 491	1, 155, 526	. 051	(1)	23, 140, 086	(1)	2, 524, 033
Maryland	10, 061, 435	6. 8	10, 295, 944	(1)	(1)	--------	38, 533	--------	867, 679
Massachusetts	10, 054, 656	9. 2	9, 472, 638	513, 282	. 054	--------	--------	(1)	2, 003, 318
Michigan	20, 206, 255	7. 5	5, 250, 719	305, 003	. 058	(1)	(1)	(1)	1, 174, 466
Minnesota	6, 449, 867	7. 0	5, 386, 208	241, 379	. 045	--------	(1)	--------	432, 297
New Jersey	9, 671, 622	7. 8	9, 369, 188	(1)	(1)	--------	--------	--------	585, 834
New York	46, 168, 787	9. 0	34, 152, 199	1, 940, 431	. 057	(1)	(1)	29, 020	3, 692, 024
Ohio	92, 180, 216	8. 8	49, 688, 330	2, 723, 503	. 055	(1)	39, 178, 985	(1)	3, 514, 337
Pennsylvania	162, 644, 461	9. 7	53, 364, 509	2, 469, 719	. 046	1, 127, 116	108, 938, 943	--------	4, 670, 856
Tennessee	1, 199, 977	7. 4	1, 169, 812	49, 717	. 042	--------	--------	--------	90, 423
Utah	3, 820, 700	12. 0	3, 770, 918	(1)	(1)	--------	--------	--------	90, 370
Washington	488, 615	7. 5	479, 045	28, 488	. 059	--------	--------	1, 000	49, 062
West Virginia	20, 589, 325	10. 0	18, 241, 667	998, 989	. 055	--------	(1)	--------	358, 526
Kentucky, Missouri, Rhode Island, and Wisconsin	16, 689, 631	8. 2	16, 690, 962	883, 485	. 053	--------	--------	--------	802, 073
Undistributed	--------	-----	--------	1, 353, 554	. 058	5, 710, 916	44, 880, 136	7, 102, 796	--------
	546, 859, 205	8. 6	305, 898, 176	16, 095, 478	. 053	6, 838, 032	225, 345, 259	7, 493, 667	24, 620, 175

[1] Included under "Undistributed."

TABLE 71.—*Average yield of coke-oven tar, by States, 1921–1927*

[Figures represent gallons per ton of coal charged]

State	1921	192	1923	1924	1925	1926	1927	Average for 7 years shown
Alabama	9. 1	8. 6	8. 3	8. 2	8. 4	8. 7	9. 0	8. 6
Colorado	11. 7	10. 1	10. 1	9. 5	10. 4	10. 7	10. 5	10. 4
Illinois	7. 8	8. 1	7. 3	7. 9	7. 9	7. 7	8. 3	7. 9
Indiana	5. 8	5. 9	6. 2	6. 1	5. 9	5. 8	6. 1	6. 0
Maryland	8. 1	6. 9	7. 0	6. 8	6. 9	6. 5	6. 8	7. 0
Massachusetts	8. 0	6. 5	7. 9	8. 3	7. 5	8. 9	9. 2	8. 0
Michigan	7. 2	7. 3	7. 1	7. 6	7. 4	7. 3	7. 5	7. 3
Minnesota	8. 6	7. 5	7. 7	8. 4	8. 0	7. 3	7. 0	7. 8
New Jersey	10. 8	8. 7	7. 9	8. 4	8. 1	8. 0	7. 8	8. 5
New York	9. 4	8. 5	8. 7	8. 7	8. 6	8. 8	9. 0	8. 8
Ohio	9. 2	8. 1	8. 5	9. 0	9. 1	8. 6	8. 8	8. 8
Pennsylvania	10. 2	8. 6	9. 1	9. 9	9. 3	9. 4	9. 7	9. 5
Tennessee	8. 7	8. 7	2. 6	8. 9	8. 2	7. 5	7. 4	7. 4
Utah	--------	--------	--------	10. 4	11. 3	11. 4	12. 0	11. 3
Washington	7. 1	6. 3	7. 3	8. 2	8. 1	7. 9	7. 5	7. 5
West Virginia	10. 7	8. 9	10. 7	11. 3	10. 2	10. 1	10. 0	10. 3
Kentucky, Missouri, Rhode Island, and Wisconsin	8. 0	7. 9	7. 5	8. 3	8. 0	7. 2	8. 2	7. 9
United States	8. 8	8. 0	8. 1	8. 6	8. 4	8. 3	8. 6	8. 4

TABLE 72.—*Disposal of coke-oven tar produced in the United States, 1926–27, in gallons*

	1926			1927		
	Furnace plants	Other plants	Total	Furnace plants	Other plants	Total
Sold	175, 380, 938	101, 867, 584	277, 248, 522	197, 429, 480	108, 468, 696	305, 898, 176
Used:						
As fuel under boilers	8, 003, 465		8, 003, 465	6, 813, 532	24, 500	6, 838, 032
In open-hearth or other metallurgical plants	250, 834, 295		250, 834, 295	225, 345, 259		225, 345, 259

TABLE 73.—*Per cent of coke-oven tar sold and per cent used by the producer, 1918–1927* [1]

Year	Sold	Used by producer	Year	Sold	Used by producer
1918	76. 0	24. 0	1923	48. 0	52. 0
1919	75. 4	24. 6	1924	49. 7	50. 3
1920	48. 3	51. 7	1925	49. 9	50. 1
1921	53. 5	46. 5	1926	52. 4	47. 6
1922	49. 5	50. 5	1927	55. 9	44. 1

[1] The percentages are based on the total production, no account being taken of changes in stock.

TABLE 74.—*Production and sales of coke-oven, coal-gas, water-gas, and oil-gas tar in the United States, 1918–1927*

	Coke-oven tar [1]	Coal-gas tar [2]	Total coal tar	Water and oil gas tar
Production (gallons):				
1918	263, 299, 470	52, 694, 826	315, 994, 296	100, 985, 156
1919	288, 901, 739	53, 146, 421	342, 048, 160	[3] 105, 318, 339
1920	360, 664, 124	51, 264, 956	411, 929, 080	116, 073, 907
1921	253, 051, 649	(4)	309, 051, 649	(5)
1922	327, 779, 734	48, 082, 228	375, 861, 962	104, 555, 028
1923	440, 907, 109	(4)	493, 407, 109	(5)
1924	422, 074, 326	(6)	475, 074, 326	(5)
1925	480, 848, 814	(4)	534, 848, 814	(5)
1926	529, 486, 374	(6)	583, 486, 374	(5)
1927	546, 859, 205	(6)	600, 859, 205	(5)
Sales (gallons):				
1918	200, 233, 002	47, 727, 839	247, 960, 841	55, 283, 484
1919	217, 707, 157	49, 307, 852	267, 015, 009	[3] 58, 557, 947
1920	174, 363, 696	46, 604, 133	220, 967, 829	59, 238, 730
1921	135, 293, 047	51, 976, 307	187, 269, 354	[3] 53, 432, 945
1922	162, 204, 417	41, 266, 074	203, 470, 491	47, 338, 489
1923	211, 739, 469	47, 840, 512	259, 579, 081	[3] 49, 990, 820
1924	209, 979, 999	(6)	258, 479, 999	(5)
1925	240, 160, 986	49, 175, 979	289, 336, 965	[3] 61, 471, 124
1926	277, 248, 522	(6)	326, 248, 522	(5)
1927	305, 898, 176	(6)	354, 898, 176	(5)
Value of sales:				
1918	$6, 364, 972	$1, 863, 580	$8, 228, 552	$1, 805, 865
1919	6, 918, 549	2, 156, 471	9, 075, 020	[3] 2, 012, 723
1920	6, 378, 040	2, 010, 186	8, 388, 226	2, 109, 388
1921	5, 645, 309	2, 811, 728	8, 457, 037	[3] 2, 192, 015
1922	6, 419, 743	1, 955, 950	8, 375, 693	1, 879, 490
1923	9, 250, 552	2, 461, 691	11, 712, 243	[3] 2, 001, 363
1924	9, 623, 520	(6)	12, 293, 520	(5)
1925	11, 903, 196	2, 750, 719	14, 653, 915	[3] 2, 594, 025
1926	14, 103, 760	(6)	16, 803, 760	(5)
1927	16, 095, 478	(6)	18, 795, 478	(5)

[1] Includes tar produced in by-product coke ovens operated by city gas companies.

[2] The figures here given for coal-gas tar include only the operations of coal-gas retorts. For 1918, 1920, and 1922 they are taken from special studies by the U. S. Geological Survey. For 1919, 1921, 1923, and 1925 figures deduced from the census as follows are used. The census figures include the tar produced in by-product ovens operated by city gas companies. A special retabulation was made of the reports made to the Bureau of Mines for coke ovens operated in conjunction with city gas plants, and the totals for this group were subtracted from the census figures.

[3] As reported by the Bureau of the Census.

[4] Estimate based upon reported sales as given below included in total.

[5] No data.

[6] Estimate included in total.

AMMONIA

TABLE 75.—*Ammonia produced at coke-oven plants, by States, in 1927, in pounds*

State	Sulphate	Liquor (NH_3 content)	Sulphate equivalent of all forms	
			Total	Per ton of coal coked
Alabama	(1)	(1)	154, 100, 954	24. 8
Colorado	17, 796, 000		17, 796, 000	20. 5
Illinois	(1)	(1)	100, 697, 318	23. 1
Indiana	115, 187, 668	5, 528, 325	137, 300, 968	18. 4
Maryland	29, 637, 083		29, 637, 083	20. 1
Massachusetts	(1)	(1)	21, 729, 319	19. 9
Michigan	(1)	(1)	65, 448, 027	24. 3
Minnesota	(1)	(1)	17, 543, 742	19. 1
New Jersey	27, 030, 724		27, 030, 724	21. 7
New York	(1)	(1)	115, 653, 531	22. 6
Ohio	[2]587, 443, 386	[2]12, 424, 629	244, 550, 239	23. 4
Pennsylvania			392, 591, 663	23. 5
Tennessee	3, 337, 332		3, 337, 332	20. 6
Utah	9, 261, 900		9, 261, 900	29. 1
Washington		536, 030	2, 144, 120	33. 0
West Virginia	46, 819, 377		46, 819, 377	22. 7
Kentucky, Missouri, Rhode Island, and Wisconsin	(1)	(1)	49, 278, 055	24. 2
Undistributed	379, 627, 990	36, 205, 739		
	1, 216, 141, 460	54, 694, 723	1, 434, 920, 352	22. 7

[1] Included under "Undistributed."

[2] Figures for Ohio and Pennsylvania combined to avoid disclosing individual operations.

TABLE 76.—*Average monthly prices of sulphate of ammonia per 100 pounds, 1912–1927*

[Quotations, 1912–1916, abstracted from Oil, Paint, and Drug Reporter, at New York; 1917–1927, from Iron Trade Review, f. o. b. producers' works. Figures for 1912–1922 compiled by C. G. Atwater, of the Barrett Co.]

Month	1912	1913	1914	1915	1916	1917	1918	1919
January	$3. 20¾	$3. 28	$2. 90	$2. 71¼	$3. 96½	$4. 12	$5. 03	$4. 68
February	3. 24¼	3. 30	2. 85	2. 98¾	3. 96¼	4. 18	5. 22½	4. 50
March	3. 28	3. 30	2. 85	3. 16	3. 92½	(1)	5. 40½	4. 25
April	3. 38	3. 30	2. 85	3. 10⅝	3. 68¾	(1)	5. 46	4. 00
May	3. 40	3. 30	2. 70	3. 20	3. 57½	4. 72½	5. 59½	3. 80
June	3. 40	3. 12	2. 55	3. 22½	3. 53	4. 80	5. 10	3. 60
July	3. 25	3. 00	2. 52	3. 41	3. 43½	4. 90	4. 50	3. 40
August	3. 22½	2. 98	2. 60	3. 53	3. 58¾	4. 90	4. 50	3. 53
September	3. 29	3. 07	2. 76⅞	3. 37½	3. 77½	4. 92½	4. 50	3. 53
October	3. 28	3. 10	2. 67½	3. 37½	4. 02½	4. 95	4. 50	3. 57
November	3. 20⅝	3. 06¼	2. 67½	3. 57	4. 21¼	4. 92½	4. 50	3. 78
December	3. 22½	2. 95	2. 67½	3. 93¾	4. 32½	4. 90	4. 86	3. 93
Average	3. 28	3. 14	2. 71	3. 30	3. 83	4. 73	4. 93	3. 88

Month	1920	1921	1922	1923	1924	1925	1926	1927
January	$4. 00	$3. 37½	$2. 20	$3. 10	$2. 72½	$2. 67½	$2. 82½	$2. 50
February	4. 00	3. 12½	2. 35	3. 15⅝	2. 72½	2. 62½	2. 72½	2. 52½
March	4. 55	2. 92½	2. 60½	3. 19½	2. 72½	2. 52½	2. 68½	2. 52½
April	4. 55	2. 57½	2. 65	3. 22½	2. 65	2. 52½	2. 62½	2. 50
May	4. 55	2. 45	2. 67	3. 21½	2. 62½	2. 42½	2. 62½	2. 42
June	4. 55	2. 45	2. 72	3. 13¾	2. 57½	2. 37½	2. 50	2. 42
July	4. 55	2. 35	2. 82	3. 10	2. 50	2. 67½	2. 47½	2. 25
August	4. 80	2. 00	2. 82	3. 07½	2. 35	2. 75	2. 47½	2. 25
September	4. 80	1. 95	2. 90	3. 02½	2. 50	2. 80	2. 47½	2. 30
October	4. 25	2. 20	3. 05	3. 01¼	2. 60	2. 95	2. 47½	2. 32½
November	3. 75	2. 20	3. 07	2. 93¾	2. 65	2. 85	2. 47½	2. 32½
December	3. 38	2. 20	3. 12	2. 76¼	2. 67½	2. 80	2. 47½	2. 32½
Average	4. 31	2. 48	2. 75	3. 08	2. 61	2. 66	2. 57	2. 39

[1] No market.

LIGHT OIL AND ITS DERIVATIVES

BENZOL AND RELATED PRODUCTS

TABLE 77.—*Producers' price per gallon of pure benzol f. o. b. works and tank-wagon price of gasoline, 1923–1927, by months*

[Prices of benzol are those quoted by Iron Trade Review; of tank-wagon gasoline, average for five cities, computed by J. E. Pogue and published in Commerce Yearbook, 1928, vol. 1, p. 307]

Month	1923		1924		1925		1926		1927	
	Benzol	Gasoline	Benzol	Gasoline	Benzol	Gasoline	Benzol	Gasoline	Benzol	Gasoline
January	$0.300	$0.193	$0.220	$0.152	$0.250	$0.141	$0.235	$0.154	$0.235	$0.171
February	.300	.201	.250	.177	.230	.175	.230	.159	.235	.168
March	.300	.206	.250	.180	.240	.180	.230	.164	.23	.159
April	.300	.199	.250	.180	.240	.175	.235	.169	.24	.149
May	.290	.189	.250	.178	.240	.174	.245	.182	.24	.149
June	.260	.195	.245	.169	.245	.181	.250	.186	.23	.145
July	.260	.194	.250	.159	.250	.184	.250	.186	.23	.146
August	.260	.172	.250	.154	.260	.177	.250	.186	.23	.143
September	.240	.151	.250	.151	.250	.151	.250	.186	.23	.142
October	.220	.142	.250	.136	.240	.148	.245	.178	.23	.142
November	.215	.131	.250	.134	.240	.150	.245	.174	.23	.142
December	.210	.131	.250	.134	.240	.152	.240	.174	.23	.142
Average	.263	.175	.247	.159	.244	.166	.242	.175	.233	.150

TABLE 78.—*Monthly spot prices of coal-tar products in New York market, 1923–1927*

[As quoted by Oil, Paint, and Drug Reporter. Figures are averages of high and low quotations for each month]

Month	Benzol (90 per cent), per gallon					Toluol, per gallon				
	1923	1924	1925	1926	1927	1923	1924	1925	1926	1927
January	$0.270	$0.210	$0.230	$0.240	$0.240	$0.300	$0.260	$0.260	$0.350	$0.350
February	.295	.230	.220	.240	.235	.300	.260	.260	.350	.350
March	.320	.230	.220	.240	.230	.300	.260	.260	.350	.350
April	.320	.230	.220	.240	.240	.300	.260	.260	.350	.350
May	.270	.230	.215	.245	.240	.300	.260	.260	.350	.350
June	.250	.230	.230	.250	.230	.300	.260	.260	.350	.350
July	.250	.230	.240	.250	.230	.300	.260	.260	.350	.350
August	.250	.230	.240	.250	.230	.300	.260	.260	.350	.350
September	.250	.230	.240	.250	.230	.300	.260	.260	.350	.350
October	.210	.230	.240	.245	.230	.260	.260	.285	.350	.350
November	.210	.230	.235	.240	.210	.260	.260	.330	.350	.350
December	.210	.230	.240	.240	.210	.260	.260	.300	.350	.350
Average	.259	.228	.225	.244	.230	.290	.260	.271	.350	.350

Month	Solvent naphtha, per gallon					Naphthalene flakes, per pound				
	1923	1924	1925	1926	1927	1923	1924	1925	1926	1927
January	$0.270	$0.270	$0.240	$0.350	$0.350	$0.059	$0.065	$0.055	$0.061	$0.045
February	.270	.280	.240	.350	.350	.068	.063	.055	.058	.045
March	.270	.280	.240	.350	.350	.085	.061	.055	.060	.045
April	.270	.280	.240	.350	.350	.095	.055	.053	.060	.045
May	.270	.240	.245	.350	.350	.090	.053	.050	.059	.045
June	.270	.240	.250	.350	.350	.086	.050	.050	.058	.045
July	.270	.240	.250	.350	.350	.080	.050	.050	.053	.045
August	.270	.240	.250	.350	.350	.075	.050	.053	.048	.045
September	.270	.240	.255	.350	.350	.069	.053	.055	.048	.045
October	.270	.240	.260	.350	.350	.068	.045	.055	.050	.048
November	.270	.240	.305	.350	.350	.065	.050	.058	.050	.050
December	.270	.240	.350	.350	.350	.060	.055	.058	.050	.050
Average	.270	.253	.260	.350	.350	.075	.055	.054	.055	.046

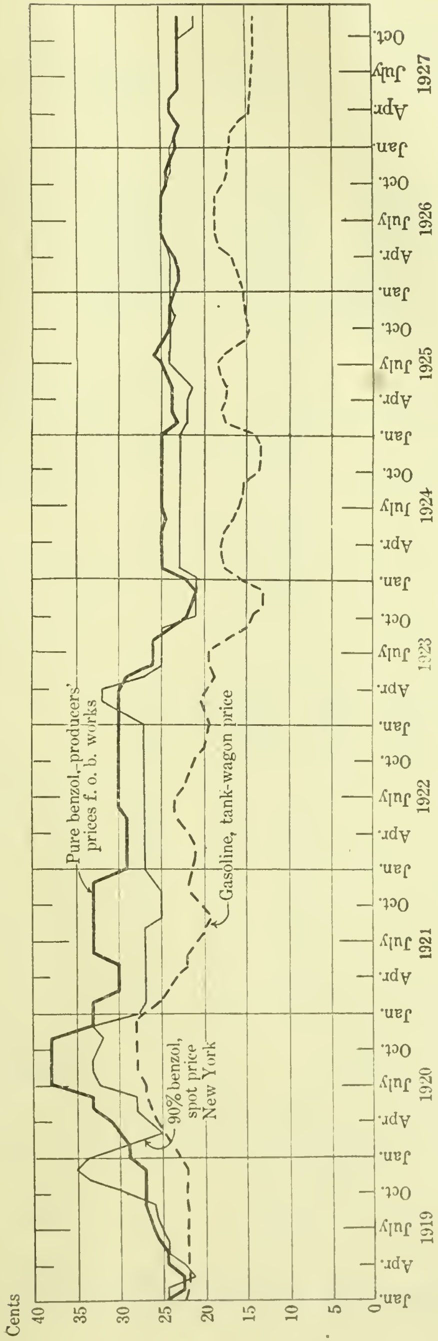

FIGURE 30.—Average price of 90 per cent benzol in New York, producers' price of pure benzol f. o. b. works, and tank-wagon price of gasoline, by months, 1919–1927

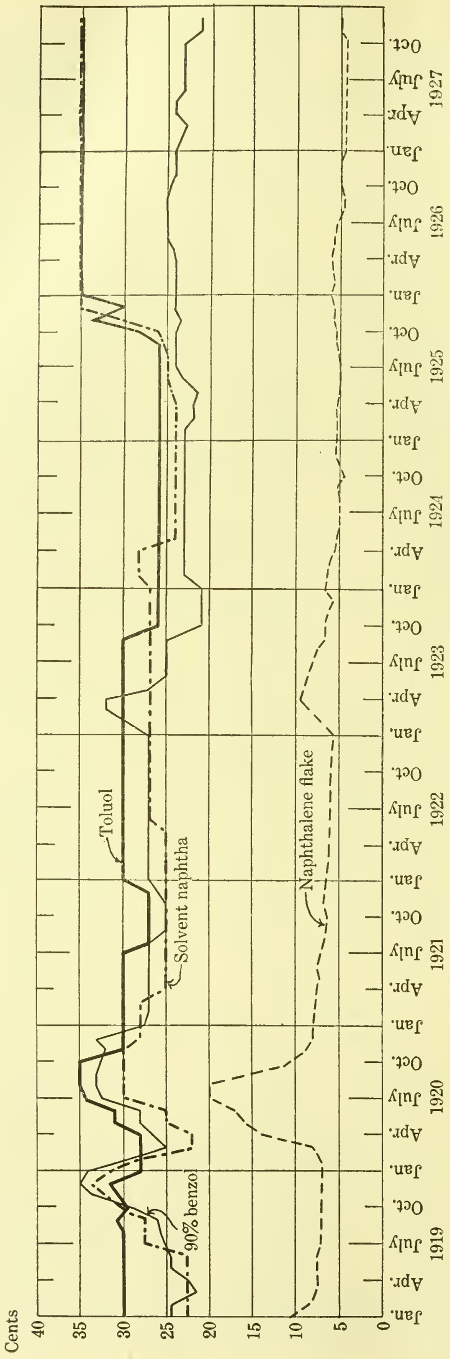

FIGURE 31.—Spot prices of 90 per cent benzol, toluol, solvent naphtha, and flake naphthalene in New York, by months, 1919-1927

TABLE 79.—*Production of motor fuel in the United States, 1918–1927, in gallons*

Year	Gasoline production of petroleum refineries	Natural gasoline (total production)	Benzol produced, all grades, including motor benzol		
			Coke ovens	Gas works, including oil and water gas	Tar refineries, etc.[1]
1918	3,570,000,000	283,000,000	44,805,000	[2] 5,633,000	3,015,000
1919	3,958,000,000	352,000,000	61,068,000	(3)	1,826,000
1920	4,883,000,000	385,000,000	72,994,000	[4] 502,000	876,000
1921	5,154,000,000	450,000,000	54,459,000	(5)	2,172,000
1922	6,202,000,000	506,000,000	70,112,000	(5)	[6] 775,000
1923	7,556,000,000	816,000,000	97,335,000	(5)	[6] 395,000
1924	8,960,000,000	934,000,000	91,904,000	(5)	[6] 630,000
1925	10,903,000,000	1,127,000,000	103,821,000	(5)	[6] 742,000
1926	12,589,000,000	1,363,000,000	112,489,000	(5)	[6] 377,000
1927	13,878,000,000	1,641,000,000	109,003,000	(5)	[6] 371,000

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[1] As reported to the U. S. Tariff Commission.
[2] Of this only 2,177,000 gallons was sold, the balance being returned to the gas.
[3] Data not available in comparable form.
[4] Quantity sold, used because of apparent double counting between production figures of crude and refined benzol.
[5] Can not be shown without disclosing individual returns.
[6] Does not include a small amount of motor benzol which can not be shown without disclosing individual returns.

CRUDE LIGHT OIL

TABLE 80.—*Number of plants making light oil or derivatives, by States, 1926–27*

State	1926				1927			
	Total making coke	Making crude light oil	Making any refined product	Making motor benzol	Total making coke	Making crude light oil	Making any refined product	Making motor benzol
Alabama	8	8	6	6	8	8	6	6
Colorado	1	1	1	1	1	1	1	1
Illinois	6	4	3	2	6	4	3	2
Indiana	7	4	4	4	7	4	4	4
Maryland	1	1	1	1	1	1	1	1
Massachusetts	2	--------	--------	--------	3	--------	--------	--------
Michigan	5	2	1	1	6	2	1	1
Minnesota	3	2	2	2	3	1	1	1
New Jersey	2	--------	--------	--------	2	--------	--------	--------
New York	8	7	5	5	8	7	6	6
Ohio	13	13	11	11	14	13	11	11
Pennsylvania	10	9	8	8	10	9	8	8
Tennessee	1	1	1	1	1	1	1	1
Utah	1	1	1	1	1	1	1	1
Washington	1	--------	--------	--------	1	--------	--------	--------
West Virginia	4	4	3	2	3	3	3	2
Kentucky, Missouri, Rhode Island, and Wisconsin	4	3	2	--------	4	3	2	--------
	77	60	49	45	79	58	49	45

TABLE 81.—*Crude light oil produced at coke-oven plants in the United States in 1927, by States, in gallons*[1]

State	Average yield per ton of coal coked	Produced	Refined on the premises
Alabama	2.9	18,284,184	15,936,474
Colorado	3.1	2,730,465	2,731,942
Illinois	2.7	9,542,366	6,253,787
Indiana	2.6	17,993,087	17,970,513
Maryland	2.5	3,664,198	3,670,152
New York	2.8	12,528,580	21,470,759
Ohio	3.1	30,866,473	27,961,230
Pennsylvania	3.1	50,520,585	50,168,671
Tennessee	2.5	411,369	412,165
Utah	3.6	1,140,550	1,140,550
West Virginia	3.1	6,387,132	6,374,230
Kentucky, Michigan, Minnesota, Missouri, and Wisconsin	2.4	10,419,244	6,982,256
	2.9	164,488,233	161,072,729

[1] In addition to the quantity refined on the premises, a few plants reported the sale of crude light oil. The total quantity sold in 1927 was 9,265,948 gallons, valued at $1,077,957, or 11.6 cents per gallon.

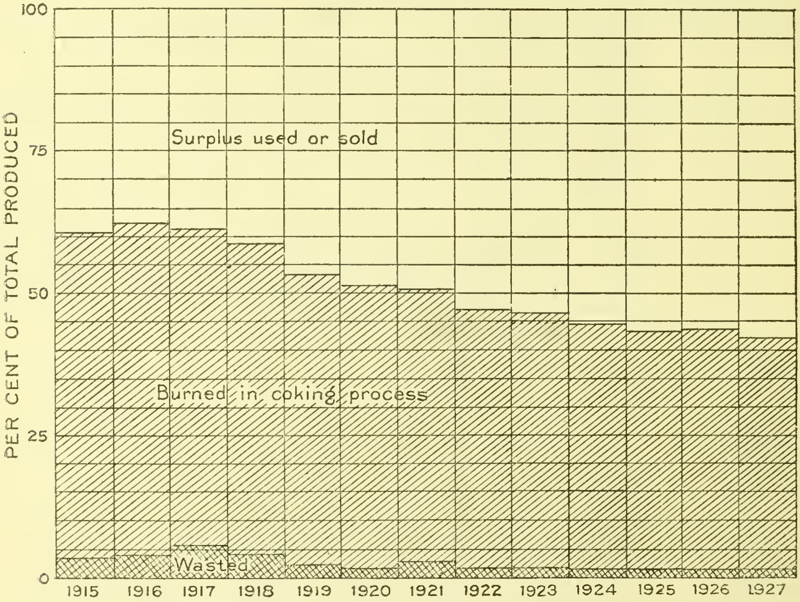

FIGURE 32.—Disposition of gas produced at by-product ovens, 1915–1927

COKE-OVEN GAS

As gas has now become the most valuable of coke-oven by-products (fig. 27), it is significant to note the gradual increase in the proportion of surplus gas available for sale and the concomitant decrease in the quantities wasted and used in operation. (See Table 82 and fig. 32.) More efficient ovens have been designed and installed; and at plants supplying gas for city use operators have been utilizing lean gases such as blue water gas and producer gas for oven heating, thus making available for sale more and more of the richer gas. The result of this movement is demonstrated by the fact that in 1915 the surplus constituted only 39.5 per cent of total quantity produced, while in 1927 it had risen to 58.2 per cent.

The effort to increase the percentage of surplus gas has been stimulated by the higher prices obtainable since the war. The trend of gas prices since 1913 is shown in Table 88. Whereas the period since 1913 has witnessed violent fluctuations in the price of coal-tar crudes the direction of gas prices has been generally upward, and as already noted the surplus gas has become the chief auxiliary source of revenue at by-product works and yields an amount approaching that realized from the tar, ammonia, and light-oil products combined. (Fig. 27.)

In 1927, 79 plants reported the production of coke-oven gas. Their combined output was approximately 700,894,799,000 cubic feet. (Table 83.) Of this quantity 280,770,957,000 cubic feet was burned in the ovens to produce the coke; 408,389,357,000 cubic feet was surplus gas, either sold or used about the plant for some purpose not immediately connected with coking; and 11,734,485,000 cubic feet was reported as wasted, including leakage and gas for which no use could be found.

TABLE 82.—*Disposition of gas from by-product coke ovens, 1915–1927, in per cent*

Year	Wasted	Burned in coking process	Surplus sold or used (not for ovens)	Year	Wasted	Burned in coking process	Surplus sold or used (not for ovens)
1915	3.2	57.3	39.5	1922	1.9	45.9	52.2
1916	4.0	58.4	37.6	1923	2.1	44.9	53.0
1917	5.4	55.7	38.9	1924	2.0	42.4	55.6
1918	4.1	54.8	41.1	1925	1.8	41.6	56.6
1919	2.6	51.0	46.4	1926	1.7	42.0	56.3
1920	2.2	49.5	48.3	1927	1.7	40.1	58.2
1921	2.9	47.4	49.7				

The gas wasted constituted less than 2 per cent of the total production; 40 per cent went to heat the coke ovens, leaving a surplus of 58 per cent, a slightly higher proportion than in 1926, when the surplus gas represented 56 per cent of the total produced. The disposition of the surplus gas is shown in Tables 83 to 86. The amount used under boilers in the coke plants forms only a small part of the total output, rarely exceeding 10 per cent, and in 1927 was but 3.7 per cent. That the steel industry still affords the principal outlet for coke-oven gas is seen by the fact that somewhat more than one-third of the total production, equivalent to about 60 per cent of the surplus gas, was absorbed by steel or other affiliated plants. The remaining 19.6 per cent of the total production in 1927 was sold for other purposes, including domestic cooking and lighting, street lighting, and various industrial uses. The relative proportions used for each of these last purposes can not be stated, because the companies do not have the necessary records. In an effort to ascertain the quantities delivered to large industries direct by the by-product operators without the assistance of a public-utility distributing system, information has been collected since 1922 showing the quantity sold for general industrial purposes. (See Table 86.) In 1927 this amounted to 30,661,000,000 cubic feet, or 4.4 per cent of the entire production. Unquestionably, however, a considerable part of the quantity distributed through city mains, in addition to the amount specified above, was used for industrial purposes.

TABLE 83.—*Coke-oven gas produced and sold in the United States in 1927, by States*

State	Number of active plants	Produced (M cubic feet)	Used in process (M cubic feet)	Surplus sold or used			Wasted (M cubic feet)
				M cubic feet	Value		
					Total	Average	
Alabama	8	70, 220, 832	28, 517, 174	40, 011, 492	$3, 034, 129	$0. 076	1, 692, 166
Colorado	1	10, 240, 650	4, 102, 790	5, 953, 235	(1)	(1)	184, 625
Illinois	6	45, 711, 038	17, 603, 614	27, 988, 000	7, 892, 428	. 282	119, 424
Indiana	7	80, 196, 717	36, 738, 721	42, 691, 885	9, 598, 547	. 225	766, 111
Maryland	1	15, 824, 702	5, 063, 124	10, 761, 578	(1)	(1)	----------
Massachusetts	3	11, 218, 304	4, 102, 650	(1)	(1)	(1)	(1)
Michigan	6	29, 493, 139	10, 143, 885	(1)	(1)	(1)	(1)
Minnesota	3	10, 794, 679	5, 490, 489	(1)	(1)	(1)	(1)
New Jersey	2	15, 940, 619	4, 438, 507	11, 502, 112	(1)	(1)	----------
New York	8	55, 151, 318	17, 440, 005	36, 306, 836	9, 976, 131	. 275	1, 404, 477
Ohio	14	116, 167, 825	48, 313, 240	64, 845, 279	7, 462, 313	. 115	3, 009, 306
Pennsylvania	10	190, 467, 082	79, 369, 435	107, 851, 071	11, 317, 598	. 105	3, 246, 576
Tennessee	1	1, 621, 980	730, 676	891, 304	229, 891	. 258	----------
Utah	1	3, 502, 034	1, 614, 438	1, 518, 441	(1)	(1)	369, 155
Washington	1	675, 389	----------	642, 100	833, 063	1. 297	33, 289
West Virginia	3	21, 334, 247	8, 721, 188	12, 166, 602	1, 444, 785	. 119	446, 457
Kentucky, Missouri, Rhode Island, and Wisconsin	4	22, 334, 244	8, 381, 021	(1)	(1)	(1)	(1)
Undistributed	------	----------	----------	45, 259, 422	18, 303, 283	. 244	462, 899
	79	700, 894, 799	280, 770, 957	408, 389, 357	70, 092, 168	. 172	11, 734, 485

[1] Included under "Undistributed."

TABLE 84.—*Use of by-product oven gas in the United States in 1927, by States*

State	Used under boilers			Used in steel or other affiliated plants		
	M cubic feet	Value		M cubic feet	Value	
		Total	Average		Total	Average
Alabama	10, 164, 913	$508, 507	$0. 050	24, 746, 949	$1, 714, 209	$0. 069
Colorado	----------	----------	------	5, 953, 235	(1)	(1)
Illinois	393, 802	89, 373	. 227	3, 723, 520	443, 800	. 119
Indiana	632, 096	55, 993	. 089	30, 666, 112	4, 607, 872	. 150
Maryland	----------	----------	------	4, 799, 880	(1)	(1)
Michigan	(1)	(1)	(1)	4, 051, 522	1, 215, 456	. 300
Minnesota	(1)	(1)	(1)	1, 145, 548	(1)	(1)
New York	2, 258, 681	134, 591	. 060	15, 415, 616	1, 576, 167	. 102
Ohio	7, 341, 641	722, 623	. 098	46, 651, 405	5, 419, 628	. 116
Pennsylvania	(1)	(1)	(1)	97, 104, 596	9, 333, 957	. 096
Tennessee	189, 610	32, 210	. 170	----------	----------	------
Utah	136, 579	(1)	(1)	1, 260, 732	(1)	(1)
Washington	3, 096	2, 358	. 762	----------	----------	------
West Virginia	(1)	(1)	(1)	9, 450, 224	761, 241	. 081
Kentucky, Missouri, Rhode Island, and Wisconsin	(1)	(1)	(1)	----------	----------	------
Undistributed	4, 728, 344	320, 687	. 066	----------	1, 508, 010	. 115
	25, 848, 762	1, 866, 342	. 072	244, 969, 339	26, 580, 340	. 109

[1] Included under "Undistributed."

TABLE 84.—*Use of by-product oven gas in the United States in 1927, by States*—Continued

State	Distributed through city mains			Sold for industrial purposes		
	M cubic feet	Value		M cubic feet	Value	
		Total	Average		Total	Average
Alabama	2,548,009	$393,789	$0.155	2,551,621	$417,624	$0.164
Illinois	19,543,768	6,409,209	.328	4,326,910	950,046	.220
Indiana	5,231,111	3,749,950	.717	6,162,566	1,184,732	.192
Maryland	5,961,698	(1)	(1)	----------	----------	------
Massachusetts	(1)	(1)	(1)	(1)	(1)	(1)
Michigan	13,735,215	3,800,988	.277	(1)	(1)	(1)
Minnesota	(1)	(1)	(1)	----------	----------	------
New Jersey	11,502,112	(1)	(1)	----------	----------	------
New York	14,702,284	7,084,125	.482	3,930,255	1,181,248	.301
Ohio	1,384,291	350,797	.253	9,467,942	969,265	.102
Pennsylvania	7,846,430	1,751,986	.223	(1)	(1)	(1)
Tennessee	----------	----------	------	701,694	197,681	.282
Utah	66,246	(1)	(1)	54,884	(1)	(1)
Washington	639,004	830,705	1.300	----------	----------	------
West Virginia	(1)	(1)	(1)	----------	----------	------
Kentucky, Missouri, Rhode Island, and Wisconsin	10,299,549	2,906,923	.282	(1)	(1)	(1)
Undistributed	13,450,391	8,970,609	.290	3,465,276	495,809	.141
	106,910,108	36,249,081	.339	30,661,148	5,396,405	.176

[1] Included under "Undistributed."

Tables 84 and 85 give details of the distribution of gas, by States. The market for gas, of course, varies with the industries of the locality and with the density of population. In the centers of steel production in Pennsylvania and Ohio, in the Buffalo and Birmingham districts, and at the plant at Pueblo, Colo., the bulk of the surplus gas is delivered to affiliated steelworks or used under boilers at the by-product plants themselves. At other plants, either owned by public utilities or supplying them with gas under contract, the greater part of the output is distributed through city mains. This condition prevailed in Massachusetts, Michigan, Minnesota, New Jersey, Washington, Missouri, Rhode Island, and Wisconsin, in that part of Indiana outside of the Chicago district, and even at a number of plants in the Chicago district itself.

TABLE 85.—*Yield and disposal of gas, and number of plants supplying gas for certain uses, by States, in 1927*

State	Yield of gas (M cubic feet) per ton of coal coked	Disposal (per cent of total)						Number of plants	
		In coke plants		To steel or other affiliated plants	For distribution through city mains	For industrial purposes	Wasted	Supplying gas for city distribution	Supplying gas to steel or other affiliated plants
		For use in heating coke ovens	For use under boilers						
Alabama	11.3	40.6	14.5	35.3	3.6	3.6	2.4	3	4
Colorado	11.8	40.1	--------	58.1	--------	--------	1.8	--------	1
Illinois	10.5	38.5	.8	8.1	42.8	9.5	.3	5	2
Indiana	10.8	45.8	.8	38.2	6.5	7.7	1.0	5	4
Maryland	10.7	32.0	--------	30.3	37.7	--------	--------	1	1
Massachusetts	10.3	36.6	--------	--------	(1)	(1)	(1)	3	--------
Michigan	10.9	34.4	(1)	13.7	46.6	(1)	(1)	6	2
Minnesota	11.7	50.9	(1)	10.6	(1)	--------	(1)	2	1
New Jersey	12.8	27.8	--------	--------	72.2	--------	--------	2	--------
New York	10.8	31.6	4.1	28.0	26.7	7.1	2.5	5	3
Ohio	11.1	41.6	6.3	40.1	1.2	8.2	2.6	3	11
Pennsylvania	11.4	41.6	(1)	51.0	4.1	(1)	1.7	5	8
Tennessee	10.0	45.0	11.7	--------	--------	43.3	--------	--------	--------
Utah	11.0	46.1	3.9	36.0	1.9	1.6	10.5	1	1
Washington	10.4	--------	.5	--------	94.6	--------	4.9	1	--------
West Virginia	10.3	40.9	(1)	44.3	(1)	--------	2.1	1	2
Kentucky, Missouri, Rhode Island, and Wisconsin	11.0	37.5	(1)	--------	46.1	(1)	(1)	3	--------
	11.1	40.1	3.7	34.9	15.2	4.4	1.7	46	40

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[1] Not at liberty to publish.

TABLE 86.—*Disposition of gas from by-product ovens in the United States, 1922–1927*

	Millions of cubic feet	Percentage of total production	Value	
			Total	Cents per M
1922				
Used under boilers	19,124	4.3	$1,251,325	6.5
Used in steel or other related plants	144,976	32.7	15,942,446	11.0
Distributed through city mains	56,930	12.9	20,326,648	35.7
Sold for industrial purposes	10,353	2.3	1,104,901	10.7
Total sold or used (not for ovens)	231,383	52.2	38,625,320	16.7
Used in heating ovens	203,239	45.9	--------	--------
Wasted	8,049	1.9	--------	--------
Total produced	442,671	100.0	--------	--------
1923				
Used under boilers	33,741	5.6	1,820,808	5.4
Used in steel or other related plants	200,099	33.3	22,646,134	11.3
Distributed through city mains	65,143	10.8	23,116,578	35.5
Sold for industrial purposes	19,459	3.3	4,025,700	20.7
Total sold or used (not for ovens)	318,442	53.0	51,609,220	16.2
Used in heating ovens	270,168	44.9	--------	--------
Wasted	12,545	2.1	--------	--------
Total produced	601,155	100.0	--------	--------
1924				
Used under boilers	29,794	5.5	1,729,013	5.8
Used in steel or other related plants	187,172	34.6	21,007,607	11.2
Distributed through city mains	65,677	12.1	23,486,416	35.8
Sold for industrial purposes	18,561	3.4	3,561,911	19.2
Total sold or used (not for ovens)	301,204	55.6	49,784,947	16.5
Used in heating ovens	229,298	42.4	--------	--------
Wasted	10,599	2.0	--------	--------
Total produced	541,101	100.0	--------	--------

TABLE 86.—*Disposition of gas from by-product ovens in the United States, 1922–1927*—Continued

	Millions of cubic feet	Percentage of total production	Value	
			Total	Cents per M
1925				
Used under boilers	25,239	3.9	$1,451,253	5.8
Used in steel or other related plants	230,030	36.0	26,380,657	11.5
Distributed through city mains	77,457	12.1	29,319,309	37.9
Sold for industrial purposes	29,528	4.6	4,333,000	14.7
Total sold or used (not for ovens)	362,254	56.6	61,484,219	17.0
Used in heating ovens	266,112	41.6		
Wasted	11,278	1.8		
Total produced	639,644	100.0		
1926				
Used under boilers	25,954	3.7	1,438,699	5.5
Used in steel or other related plants	249,841	35.3	27,955,574	11.2
Distributed through city mains	89,566	12.7	29,978,997	33.5
Sold for industrial purposes	32,553	4.6	5,313,530	16.3
Total sold or used (not for ovens)	397,914	56.3	64,686,800	16.3
Used in heating ovens	296,431	42.0		
Wasted	12,337	1.7		
Total produced	706,682	100.0		
1927				
Used under boilers	25,849	3.7	1,866,342	7.2
Used in steel or other related plants	244,969	34.9	26,580,340	10.9
Distributed through city mains	106,910	15.2	36,249,081	33.9
Sold for industrial purposes	30,661	4.4	5,396,405	17.6
Total sold or used (not for ovens)	408,389	58.2	70,092,168	17.2
Used in heating ovens	280,771	40.1		
Wasted	11,735	1.7		
Total produced	700,895	100.0		

Within the range of the temperatures employed in present by-product coking practice the yield of gas per ton of coal charged is largely affected by the character of the coal used and depends to a lesser extent upon the method of oven operation and the design of the oven itself and still less upon the skill of the operator. The statistics of the yield of gas per ton of coal carbonized are therefore not to be used as a measure of plant-operating efficiency. They do, however, represent the results obtained under actual conditions of operations and with the coals available in different localities. The average yield, by States, is shown in the first column of Table 85. The averages per plant range from less than 10,000 cubic feet per ton of coal carbonized to more than 12,000 cubic feet. In 1927 the average for all plants was 11,100 cubic feet.

The rate at which the output of natural gas and manufactured gas has been increasing is given in Table 87 and Figure 33. It will be seen that the consumption of gas has been greatly augmented since 1913 and that increasing proportions have been supplied by the coke-oven surplus. All forms of gas fuel have participated in this expanded market. The sales of coal, oil, and water gas increased 75 per cent from 1913 to 1927 and the sales of natural gas more than doubled, but the sales of coke-oven gas increased more than sixfold. In such comparisons, however, due allowance should be made for the higher heating value of natural gas which averages about 1,075 B. t. u. per cubic foot, as compared to 550 or 575 B. t. u. for manufactured gas. Even on this basis coke-oven gas has shown a notable increase, for it has risen from 4.7 per cent of the total heating value of gas fuel in 1913 to 11.5 per cent in 1927. Table 88 shows the trend in prices of gas.

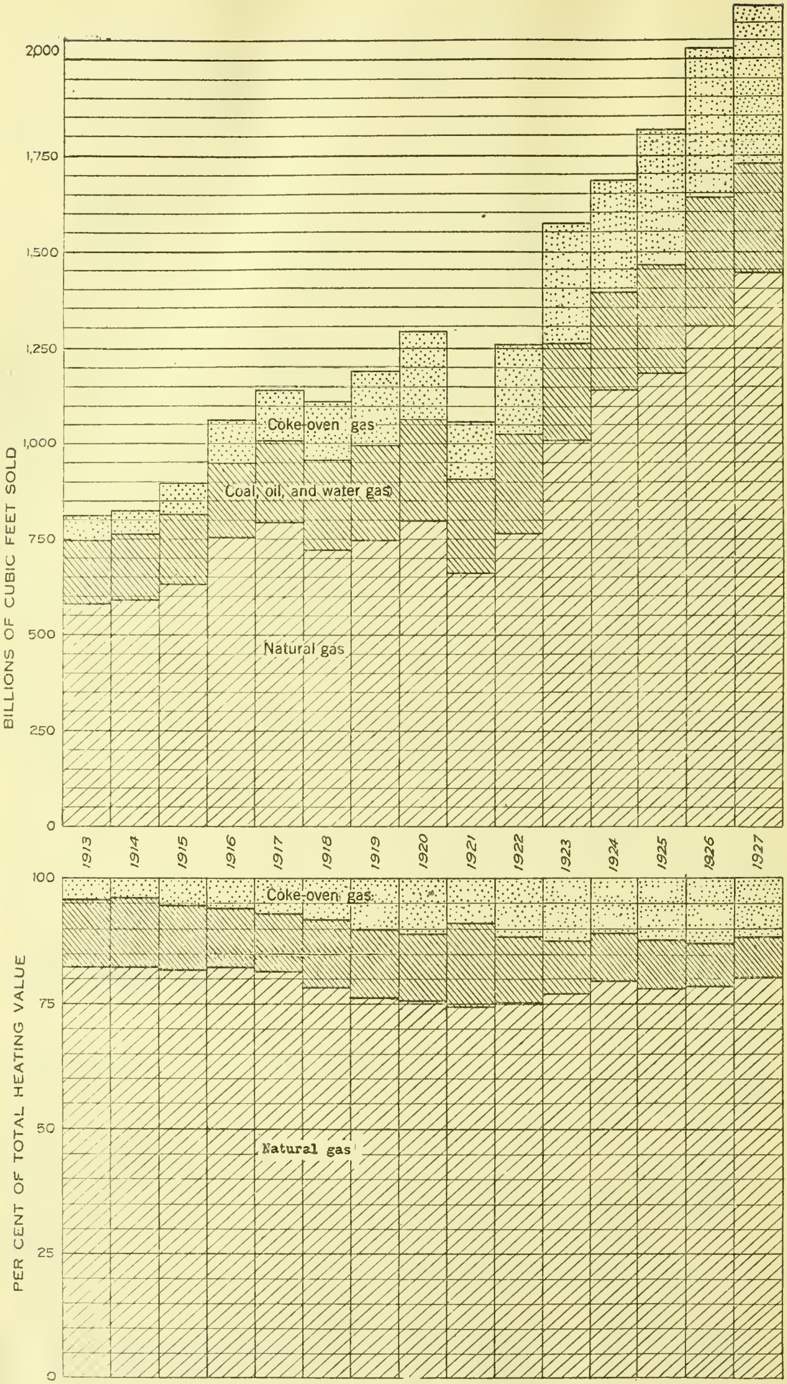

FIGURE 33.—Growth of sales of surplus coke-oven gas, other manufactured gas, and natural gas, and percentage that each formed of the total heating value of all gas sold, 1913–1927

TABLE 87.—*Total sales of gas fuel in the United States, 1913–1927*

[Does not include producer gas, blast-furnace gas, Pintsch gas, or acetylene]

Year	Quantity sold (billion cubic feet)				Rough equivalent in heating value (billion B. t. u.)			
	1 Surplus coke-oven gas	2 Coal, oil, and water gas	3 Natural gas	4 Total	5 Surplus coke-oven gas (1×550)	6 Coal, oil, and water gas (2×575)	7 Natural gas (3×1,075)	8 Total (5+6+7)
QUANTITY								
1913	64	[1] 166	582	812	35, 200	95, 450	626, 000	756, 650
1914	61	174	592	827	33, 550	100, 050	636, 000	769, 600
1915	84	[1] 182	629	895	46, 200	104, 650	676, 000	826, 850
1916	110	196	753	1, 059	60, 500	112, 700	810, 000	983, 200
1917	131	[1] 211	795	1, 137	72, 050	121, 325	855, 000	1, 048, 375
1918	158	234	721	1, 113	86, 900	134, 550	775, 000	996, 450
1919	193	[1] 248	746	1, 187	106, 150	142, 600	802, 000	1, 050, 750
1920	230	262	798	1, 290	126, 500	150, 650	858, 000	1, 135, 150
1921	154	[2] 269	662	1, 085	84, 700	154, 675	712, 000	951, 375
1922	231	257	763	1, 251	127, 050	147, 775	820, 000	1, 094, 825
1923	318	[2] 258	1, 007	1, 583	174, 900	148, 350	1, 082, 000	1, 405, 250
1924	301	[3] 260	1, 142	1, 703	165, 550	149, 500	1, 227, 000	1, 542, 050
1925	362	[2] 283	1, 189	1, 834	199, 100	162, 725	1, 278, 175	1, 640, 000
1926	398	[4] 290	1, 313	2, 001	218, 900	166, 750	1, 411, 475	1, 797, 125
1927	408	[4] 290	1, 445	2, 143	224, 400	166, 750	1, 553, 375	1, 944, 525
PER CENT								
1913	7. 9	20. 5	71. 6	100. 0	4. 7	12. 6	82. 7	100. 0
1914	7. 4	21. 0	71. 6	100. 0	4. 4	13. 0	82. 6	100. 0
1915	9. 4	20. 3	70. 3	100. 0	5. 6	12. 6	81. 8	100. 0
1916	10. 4	18. 5	71. 1	100. 0	6. 2	11. 5	82. 3	100. 0
1917	11. 5	18. 6	69. 9	100. 0	6. 9	11. 6	81. 5	100. 0
1918	14. 2	21. 0	64. 8	100. 0	8. 7	13. 5	77. 8	100. 0
1919	16. 3	20. 9	62. 8	100. 0	10. 1	13. 6	76. 3	100. 0
1920	17. 8	20. 3	61. 9	100. 0	11. 1	13. 3	75. 6	100. 0
1921	14. 2	24. 8	61. 0	100. 0	8. 9	16. 3	74. 8	100. 0
1922	18. 5	20. 5	61. 0	100. 0	11. 6	13. 5	74. 9	100. 0
1923	20. 1	16. 3	63. 6	100. 0	12. 4	10. 6	77. 0	100. 0
1924	17. 7	15. 3	67. 0	100. 0	10. 7	9. 7	79. 6	100. 0
1925	19. 7	15. 4	64. 9	100. 0	12. 1	9. 9	78. 0	100. 0
1926	19. 9	14. 5	65. 6	100. 0	12. 2	9. 3	78. 5	100. 0
1927	19. 1	13. 5	67. 4	100. 0	11. 5	8. 6	79. 9	100. 0

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[1] Estimated by assuming a uniform rate of increase between successive years reported.

[2] Total sales of manufactured gas by city gas companies as reported by the Bureau of the Census, minus gas purchased for mixing and resale, minus sales of gas made in by-product ovens operated by city gas companies as determined by a special retabulation made by the Bureau of Mines in 1927.

[3] Estimated.

[4] Estimated; subject to revision.

TABLE 88.—*Trend in prices of gas per M cubic feet, 1913–1927*

Year	Average price to householders [1]		Average value of all gas sold [2]		
	Manufactured gas (44 cities)	Natural gas (8 cities)	Natural gas [3]	Coal, oil, and water gas	Coke-oven surplus gas [4]
1913	$0.95	$0.34	$0.151	[5] $0.91	$0.088
1914	.94	.34	.159	(6)	.098
1915	.93	.34	.161	.91	.102
1916	.92	.34	.160	(6)	.098
1917	.91	.35	.179	.87	.087
1918	.95	.39	.213	.91	.087
1919	1.04	.44	.216	(6)	.086
1920	1.09	.44	.246	1.06	.140
1921	1.32	.49	.264	[7] 1.21	.168
1922	1.29	.54	.291	1.16	.167
1923	1.25	.55	.238	[7] 1.11	.162
1924	1.24	.59	.222	(6)	.165
1925	1.23	.65	.223	[7] 1.10	.170
1926	1.23	.66	[8] .229	(6)	.163
1927	1.22	.66	.220	(6)	.172

[1] Average of prices in effect on or near Apr. 15; from statistics of prices published by the Bureau of Labor Statistics. The figures for manufactured gas are the average net price per 1,000 cubic feet when 3,000 cubic feet is purchased, which amount the Bureau of Labor Statistics estimates to be the consumption of a typical family. Similarly the figures for natural gas are the average net price per 1,000 cubic feet when 5,000 cubic feet is purchased.

[2] As reported by operators to the Bureau of Mines.

[3] Average value of all natural gas at point of consumption or at town border when sold to local distributing company.

[4] Includes value of gas used by producer (not for ovens).

[5] Represents 1912.

[6] No report.

[7] Average value of all gas sold by city gas plants as reported by the census of manufactures, including coke-oven gas used for city distribution.

[8] Revised figures.

NAPHTHALENE

TABLE 89.—*Naphthalene sold by by-product coke operators, 1918–1927*

Year	Quantity (pounds)			Value	Average receipts per pound (cents)		Receipts per ton of coke (cents)
	Crude	Refined	Total		Crude	Refined	
1918	10,403,758	5,486,689	15,890,447	$650,229	2.8	6.6	2.5
1919	4,038,455	2,663,585	6,702,040	191,364	2.0	4.1	.8
1920	11,507,703	2,941,059	14,448,762	487,974	2.7	6.1	1.6
1921	1,652,466	331,057	1,983,523	59,335	2.5	5.6	.3
1922	3,298,851	1,589,084	4,887,935	131,252	1.6	5.0	.5
1923	10,047,427	1,198,206	11,245,633	239,699	1.7	5.5	.6
1924	7,891,116	327,957	8,219,073	128,208	1.5	3.6	.4
1925	9,692,185	208,332	9,900,517	97,493	1.0	2.5	.2
1926	7,556,372	166,851	7,723,223	97,310	1.3	(1)	.2
1927	7,848,224	----------	7,848,224	86,078	1.1	----------	.2

[1] Quantity sold too small to be representative.

TABLE 90.—*Total commercial production of naphthalene from all sources in the United States and imports, 1918–1927*

[Total sales are shown for coke plants and gas works to avoid double counting in production of crude and refined]

	By-product coke ovens; sales of crude and refined	City gas works; sales of crude and refined	Tar distilleries and all other establishments	Total commercial production
Quantity (pounds):				
1918	15,890,447	896,080	40,138,092	56,924,619
1919	6,702,040	(1)	12,612,203	20,114,243
1920	14,448,762	1,760,293	26,393,411	42,602,466
1921	1,983,523	(1)	16,949,464	19,432,987
1922	4,887,935	(1)	19,323,393	25,411,328
1923	11,245,633	1,115,563	41,453,002	53,814,198
1924	8,219,073	(1)	34,683,803	44,102,876
1925	9,900,517	1,266,037	34,135,175	45,301,729
1926	7,723,223	(1)	45,165,957	53,059,180
1927	7,848,224	(1)	45,298,441	53,346,665
Value:				
1918	$650,229	$14,282	$1,281,440	$1,945,951
1919	191,364	(1)	327,201	542,565
1920	487,974	63,449	791,403	1,342,826
1921	59,335	(1)	380,167	462,502
1922	131,252	(1)	352,957	536,209
1923	239,699	42,247	652,148	934,094
1924	128,208	(1)	441,333	602,541
1925	97,493	34,751	519,773	652,017
1926	97,310	(1)	494,986	594,296
1927	86,078	(1)	470,806	558,884

	Imports of crude (free)[2]	Imports of refined (dutiable)[2]	Total imports[2]	Total produced and imported	Average spot price of flake in New York (cents per pound)
Quantity (pounds):					
1918	3,902,731	2,795	3,905,526	60,830,145	------------
1919	3,239,256	7,650	3,246,906	23,361,149	------------
1920	15,012,096	3,697,562	18,709,658	61,312,124	------------
1921	4,495,806	441,685	4,937,491	24,370,478	------------
1922	3,144,332	75,680	3,220,012	28,631,340	------------
1923	20,992,439	9,605	21,002,044	74,816,242	------------
1924	5,266,708	4,549	5,271,257	49,374,133	------------
1925	1,979,612	------------	1,979,612	47,281,341	------------
1926	6,962,719	424	6,963,143	60,022,323	------------
1927	6,576,500	18,668	6,595,168	59,941,833	------------
Value:					
1918	$130,098	$171	$130,269	$2,076,220	9.9
1919	92,265	384	92,649	635,214	7.6
1920	530,219	416,172	946,391	2,289,217	12.7
1921	135,943	31,458	167,401	629,903	7.2
1922	54,029	7,684	61,713	597,922	6.1
1923	575,563	194	575,757	1,509,851	7.5
1924	96,491	1,147	97,638	700,179	5.5
1925	26,593	------------	26,593	678,610	5.4
1926	126,088	125	126,213	720,509	5.5
1927	131,436	3,077	134,513	693,397	4.6

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[1] Data lacking or incomplete. Estimate included in total.
[2] Imports entered for consumption as reported by Tariff Commission.

BY-PRODUCT COKE OVENS OWNED BY CITY GAS COMPANIES, INCLUDED BY BUREAU OF THE CENSUS IN MANUFACTURED-GAS INDUSTRY

Reference has already been made (pp. 604–605) to the group of by-product coke plants installed by city gas companies which the Bureau of the Census classifies as a part of the "Manufactured-gas industry," and which the Bureau of Mines includes with the by-product coke industry.

The difference in classification is maintained by the two offices advisedly, in the interest of those who can use the statistics. For some purposes the census grouping is the more useful, and for others—particularly the design of ovens, technique of manufacture, and the supply and demand for coal and coke—the grouping used by the Bureau of Mines is the more significant.

To compare or combine the two sets of figures, however, allowance must be made for the difference in classification, which can be done by means of the data in Table 91, prepared for the purpose by the Bureau of Mines. The table shows in parallel columns separate figures for the group of by-product coke plants operated by city gas companies (grouped by the Bureau of the Census with the manufactured-gas industry) and for all other by-product coke plants. Thus, in 1927 there were 17 plants in the group owned by city gas companies, and they produced 1,959,930 tons of coke, 33,733,422,000 cubic feet of gas, 27,480,665 gallons of tar, 9,110,972 pounds of ammonia (NH_3 equivalent of all forms), and 2,531,538 gallons of crude light oil. Corresponding figures for each year from 1918 to 1925 are given in Coke and By-products in 1925, pages 610 to 615. By subtracting the production from the census figures for the manufactured-gas industry anyone interested may obtain the quantities of the several products produced by gas works proper, that is, coal oil, and water gas plants.

The table also shows the operations of the 62 plants not owned by city gas companies, which in 1927 produced 41,924,796 tons of coke, 667,161,377,000 cubic feet of gas, 519,378,540 gallons of tar, 349,619,116 pounds of NH_3, and 161,956,695 gallons of crude light oil. This group of plants is that covered by the census classification of "Coke, not including gas-house coke, made in by-product ovens." The figures are compiled by the Bureau of Mines from the reports of the coke producers and are accepted by the Bureau of the Census as its record of production in the years covered by the census of manufactures.

The totals for both groups of plants given in the last column of the table are the figures for the by-product coke industry as defined by the Bureau of Mines and given in the other tables of this report.

Both groups of by-product plants have been increasing in number and in volume of output. (Table 92.) The number of public-utility plants rose from 9 in 1918 to 17 in 1927, and their sales of surplus gas increased in the same period from 7,450,191,000 to 27,082,872,000 cubic feet. At the same time, however, the sales of the plants not owned by city gas companies rose from 150,908,288,000 cubic feet in 1918 to 381,306,485,000 in 1927. The proportion of the total output of coke-oven gas contributed by the public-utility group was 6.6 per cent in 1927, as against 4.7 per cent in 1918.

TABLE 91.—*Production of coke, breeze, gas, and by-products at by-product coke plants owned by city gas companies (public utilities) and included by Bureau of the Census in manufactured-gas industry, and at all other by-product coke plants, 1926–27*

Product	1926			1927		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)[1]	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)[1]	Total
Total value	$364, 773, 079	$23, 726, 899	$388, 499, 978	$340, 341, 529	$32, 648, 652	$372, 990, 181
Number of active plants	62	15	77	62	17	79
Coke:						
Production ..... net tons	42, 894, 780	1, 481, 806	44, 376, 586	41, 924, 796	1, 959, 930	43, 884, 726
Value	$239, 495, 536	$11, 252, 997	$250, 748, 533	$216, 910, 855	$15, 132, 948	$232, 043, 803
Average value	$5. 58	$7. 59	$5. 65	$5. 17	$7. 72	$5. 29
Screenings and breeze:						
Production ..... net tons	4, 036, 342	147, 111	4, 183, 453	3, 893, 411	206, 291	4, 099, 702
Sales ..... do	922, 215	14, 077	936, 292	713, 635	2, 602	716, 237
Value	$3, 232, 439	$49, 237	$3, 281, 676	$2, 031, 674	$10, 822	$2, 042, 496
Average value	$3. 51	$3. 50	$3. 50	$2. 85	$4. 16	$2. 85
Coke:						
Used by producer—						
Quantity ..... net tons	31, 094, 155	240, 150	31, 334, 305	30, 365, 658	321, 540	30, 687, 198
Value	$159, 152, 882	$1, 453, 247	$160, 606, 129	$143, 125, 332	$1, 997, 884	$145, 123, 216
Sales—						
Quantity ..... net tons	11, 342, 455	1, 239, 123	12, 581, 578	11, 097, 506	1, 493, 038	12, 590, 544
Value	$77, 691, 019	$9, 753, 646	$87, 444, 665	$70, 798, 170	$11, 871, 602	$82, 669, 772
By-products:						
Gas—						
Production ..... M cubic feet	682, 960, 958	23, 720, 870	706, 681, 828	667, 161, 377	33, 733, 422	700, 894, 799
Sales of surplus—						
Used under boilers—						
Quantity ..... M cubic feet	25, 896, 101	57, 775	25, 953, 876	25, 758, 103	90, 659	25, 848, 762
Value	$1, 431, 698	$7, 001	$1, 438, 699	$1, 849, 196	$17, 146	$1, 866, 342
Used in steel or affiliated plants—						
Quantity ..... M cubic feet	249, 733, 077	107, 572	249, 840, 649	244, 897, 054	72, 285	244, 969, 339
Value	$27, 911, 622	$43, 952	$27, 955, 574	$26, 567, 782	$12, 558	$26, 580, 340
Distributed through city mains—						
Quantity ..... M cubic feet	74, 444, 117	15, 121, 836	89, 565, 953	82, 473, 444	24, 436, 664	106, 910, 108
Value	$20, 324, 506	$9, 654, 491	$29, 978, 997	$22, 823, 046	$13, 426, 035	$36, 249, 081
Sold for industrial use—						
Quantity ..... M cubic feet	31, 403, 969	1, 149, 641	32, 553, 610	28, 177, 884	2, 483, 264	30, 661, 148
Value	$4, 546, 371	$767, 159	$5, 313, 530	$4, 333, 835	$1, 062, 570	$5, 396, 405
Tar—						
Production ..... gallons	510, 100, 089	19, 386, 285	529, 486, 374	519, 378, 540	27, 480, 665	546, 859, 205
Sales—						
Quantity ..... do	258, 129, 942	19, 118, 580	277, 248, 522	278, 473, 948	27, 424, 228	305, 898, 176
Value	$13, 035, 051	$1, 068, 709	$14, 103, 760	$14, 570, 126	$1, 525, 352	$16, 095, 478
Average value	$0. 050	$0. 056	$0. 051	$0. 052	$0. 056	$0. 053
Ammonia—						
Production (NH_3 equivalent of all forms) ..... pounds	334, 524, 019	10, 964, 073	345, 488, 092	349, 619, 116	9, 110, 972	358, 730, 088
Liquor (NH_3 equivalent)—						
Production ..... pounds	45, 746, 992	7, 776, 237	53, 523, 229	49, 825, 891	4, 868, 832	54, 694, 723
Sales ..... do	46, 036, 002	7, 412, 032	53, 448, 034	49, 011, 372	4, 982, 955	53, 994, 327
Value	$3, 130, 136	$340, 036	$3, 470, 172	$2, 335, 047	$245, 295	$2, 580, 342
Sulphate—						
Production ..... pounds	1, 155, 108, 108	12, 751, 345	1, 167, 859, 453	1, 172, 643, 719	43, 497, 741	1, 216, 141, 460
Sales ..... do	1, 141, 118, 836	11, 022, 881	1, 152, 141, 717	1, 225, 624, 762	42, 129, 207	1, 267, 753, 969
Value	$24, 411, 574	$246, 457	$24, 658, 031	$23, 904, 793	$898, 133	$24, 802, 926
Crude light oil—						
Production ..... gallons	162, 189, 466	1, 870, 086	164, 059, 552	161, 956, 695	2, 531, 538	164, 488, 233
Sales ..... do	10, 048, 590	734, 978	10, 783, 568	8, 264, 543	1, 001, 405	9, 265, 948
Value	$1, 233, 015	$97, 193	$1, 330, 208	$954, 635	$123, 322	$1, 077, 95

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[1] Includes all by-product ovens built by city gas companies, some of which are operated in conjunction with coal, oil, and water gas plants. Does not include independent by-product plants which mas sell gas to public-utility companies for distribution.

TABLE 91.—*Production of coke, breeze, gas, and by-products at by-product coke plants owned by city gas companies (public utilities) and included by Bureau of the Census in manufactured-gas industry, and at all other by-product coke plants, 1926–27*—Continued

Product	1926			1927		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total
By-products—Continued.						
Light-oil derivatives—						
Production.....gallons..	129,176,917	935,389	130,112,306	127,992,291	1,239,169	129,231,460
Sales..............do....	124,103,873	906,154	125,010,027	123,821,774	1,015,608	124,837,382
Value..................	$25,776,115	$198,653	$25,974,768	$23,881,757	$193,385	$24,075,142
Naphthalene—						
Crude—						
Production..pounds..	7,665,462	81,359	7,746,821	8,228,400	74,445	8,302,845
Sales...........do....	7,475,013	81,359	7,556,372	7,773,779	74,445	7,848,224
Value..............	$95,196	$1,014	$96,210	$84,992	$1,086	$86,078
Refined—						
Production..pounds..	139,701	....	139,701	....	....	....
Sales...........do....	166,851	....	166,851	....	....	....
Value..............	$1,100	....	$1,100	....	....	....
All other products, value..	$148,720	....	$148,720	$93,791	....	$93,791

TABLE 92.—*Summary of operations of by-product plants owned by city gas companies and of all other by-product coke plants, 1918–1927*

[The plants owned by city gas companies are included by the Bureau of the Census in the manufactured-gas industry]

Year	Plants not owned by city gas companies					Plants owned by city gas companies (public utilities)				
	Number of plants	Coke produced		Surplus gas [1]		Number of plants	Coke produced		Surplus gas [1]	
		Net tons	Per cent of total by-product coke	M cubic feet	Per cent of total surplus gas		Net tons	Per cent of total by-product coke	M cubic feet	Per cent of total surplus gas
1918.......	51	24,919,395	95.9	150,908,288	95.3	9	1,078,185	4.1	7,450,191	4.7
1919.......	56	23,894,658	95.1	183,468,750	95.1	9	1,242,963	4.9	9,355,344	4.9
1920.......	59	29,637,341	96.1	221,032,497	95.9	9	1,196,610	3.9	9,383,422	4.1
1921.......	60	19,045,898	96.4	148,166,088	96.0	7	703,682	3.6	6,134,910	4.0
1922.......	57	27,889,475	97.7	226,152,451	97.7	7	661,070	2.3	5,230,567	2.3
1923.......	58	36,637,455	97.4	310,789,918	97.6	7	960,209	2.6	7,652,336	2.4
1924.......	60	33,072,640	97.3	292,368,617	97.1	11	910,928	2.7	8,835,236	2.9
1925.......	61	38,786,990	97.2	350,178,112	96.7	13	1,125,169	2.8	12,076,160	3.3
1926.......	62	42,894,780	96.7	381,477,264	95.9	15	1,481,806	3.3	16,436,824	4.1
1927.......	62	41,924,796	95.5	381,306,485	93.4	17	1,959,930	4.5	27,082,872	6.6

[1] Surplus gas sold or used for purposes other than heating coke ovens, exclusive of a small amount wasted.

PRODUCTION OF COKE, 1880-1927, BY STATES

TABLE 93.—*Coke produced in the United States, 1880–1927, by States, in net tons*

Year	Alabama	Colorado	Georgia	Illinois	Indiana	Kansas	Kentucky	Maryland	Massachusetts	Michigan	Minnesota	Missouri	Montana	New Jersey	New Mexico
1880	60,781	25,568	38,041	12,700	--------	3,070	4,250	--------	--------	--------	--------	--------	--------	--------	--------
1881	109,033	48,587	41,376	14,800	--------	5,670	4,370	--------	--------	--------	--------	--------	--------	--------	--------
1882	152,940	102,105	46,602	11,400	--------	6,080	4,070	--------	--------	--------	--------	--------	--------	--------	1,000
1883	217,531	133,997	67,012	13,400	--------	8,430	5,025	--------	--------	--------	--------	--------	--------	--------	3,905
1884	244,009	115,719	79,268	13,095	--------	7,190	2,223	--------	--------	--------	--------	--------	75	--------	18,282
1885	301,180	131,960	70,669	10,350	--------	8,050	2,704	--------	--------	--------	--------	--------	175	--------	17,940
1886	375,054	142,797	82,680	8,103	6,124	12,493	4,528	--------	--------	--------	--------	--------	--------	--------	10,236
1887	325,020	170,698	79,241	9,198	17,658	14,950	14,565	--------	--------	--------	--------	2,970	7,200	--------	13,710
1888	508,511	179,682	83,721	7,410	11,956	14,831	23,150	--------	--------	--------	--------	2,600	12,000	--------	8,540
1889	1,030,510	187,638	94,727	11,583	8,301	13,910	13,021	--------	--------	--------	--------	5,275	14,043	--------	3,460
1890	1,072,942	245,756	102,233	5,000	6,013	12,311	12,343	--------	--------	--------	--------	6,136	14,427	--------	2,050
1891	1,282,496	277,074	103,057	5,200	3,798	14,174	33,777	--------	--------	--------	--------	6,872	29,009	--------	2,300
1892	1,501,571	[1] 373,229	81,807	3,170	3,207	9,132	36,123	--------	--------	--------	--------	7,299	34,557	--------	--------
1893	1,168,085	[1] 362,986	90,726	2,200	5,724	8,565	48,619	--------	--------	--------	--------	5,905	29,945	--------	5,803
1894	923,817	[1] 317,196	93,029	2,200	6,551	8,439	29,748	--------	--------	--------	--------	2,250	17,388	--------	6,529
1895	1,444,339	[1] 340,357	60,212	2,250	4,804	5,287	25,460	--------	--------	--------	--------	2,028	25,337	--------	14,663
1896	1,479,437	[1] 363,760	53,673	2,600	4,353	4,785	27,107	--------	--------	--------	--------	2,500	60,078	--------	24,228
1897	1,443,017	[1] 342,653	33,000	1,549	2,904	6,181	32,117	--------	--------	--------	--------	2,593	67,849	--------	1,438
1898	1,663,020	[1] 474,808	49,529	2,325	1,825	4,180	22,242	--------	--------	--------	--------	740	52,009	--------	6,980
1899	1,787,809	[1] 530,424	50,907	[2] 2,370	(2)	14,476	81,095	--------	(3)	--------	--------	2,860	56,376	--------	44,134
1900	2,110,837	[1] 618,755	73,928	(4)	(4)	5,948	95,532	--------	(4)	(4)	--------	2,087	54,731	--------	44,774
1901	2,148,911	[1] 671,303	54,550	(4)	(4)	7,138	100,285	--------	(4)	(4)	--------	4,749	57,004	--------	41,643
1902	2,552,246	[1] 1,003,393	82,064	(4)	(4)	20,902	126,879	--------	(4)	(4)	--------	5,780	53,463	--------	23,296
1903	2,693,497	[1] 1,053,840	85,546	(4)	(4)	14,194	115,362	(4)	(4)	(4)	--------	1,839	45,107	(4)	11,050
1904	2,340,219	[1] 789,060	75,812	4,439	(4)	9,460	64,112	(4)	(4)	(4)	(4)	2,446	41,497	(4)	58,259
1905	2,576,986	[1] 1,378,824	70,593	10,307	--------	4,425	79,487	(4)	(4)	(4)	(4)	1,580	31,482	(4)	89,638
1906	3,034,501	[1] 1,455,905	70,280	268,693	--------	1,698	74,064	(4)	(4)	(4)	(4)	--------	38,182	(4)	147,747
1907	3,021,794	[1] 1,421,579	74,934	372,697	--------	6,274	67,068	332,253	466,458	(4)	(4)	--------	40,714	256,057	265,125
1908	2,362,666	[1] 982,291	39,422	362,182	(4)	2,497	37,827	270,916	453,883	(4)	(4)	--------	(4)	248,893	274,565
1909	3,085,824	[1] 1,251,805	46,385	1,276,956	(4)	--------	46,371	315,587	444,349	(4)	(4)	--------	(4)	261,460	373,967
1910	3,249,027	[1] 1,346,211	43,814	1,514,504	(4)	(4)	53,857	335,373	450,001	(4)	(4)	--------	(4)	250,153	401,646
1911	2,761,521	[1] 1,177,023	37,553	1,610,212	(4)	(4)	66,099	343,451	477,564	(4)	(4)	--------	(4)	255,334	381,927
1912	2,975,489	972,941	43,158	1,764,944	2,616,339	(4)	191,555	304,715	511,596	(4)	(4)	--------	--------	304,715	413,906
1913	3,323,664	879,461	42,747	1,859,553	2,727,025	--------	317,084	236,423	531,384	(4)	(4)	--------	--------	255,792	467,945
1914	3,084,149	666,083	24,517	1,425,168	2,276,652	--------	443,959	87,852	540,631	(4)	(4)	--------	--------	255,283	362,572
1915	3,071,811	670,938	20,039	1,686,998	2,768,099	--------	526,097	313,283	504,438	(4)	127,847	(4)	--------	269,448	389,411
1916	4,298,417	1,053,553	47,127	2,320,400	3,489,660	--------	802,526	489,982	563,048	(4)	431,319	(4)	--------	210,766	502,812

[1] Utah included with Colorado.
[2] Indiana included with Illinois.
[3] Included with Pennsylvania.
[4] Included under "Combined States."

TABLE 93.—*Coke produced in the United States, 1880–1927, by States, in net tons*—Continued

Year	Alabama	Colorado	Georgia	Illinois	Indiana	Kansas	Kentucky	Maryland	Massachusetts	Michigan	Minnesota	Missouri	Montana	New Jersey	New Mexico
1917	4,892,589	1,112,449	39,589	2,289,833	3,540,718	----------	863,071	518,810	595,113	(4)	490,272	(4)	----------	423,361	577,679
1918	4,352,172	989,447	22,048	2,285,610	3,898,215	----------	818,785	474,368	556,397	(4)	784,065	(4)	----------	682.148	597,072
1919	3.380,771	613,753	18,149	1,703,903	3,702,180	----------	691,969	356,237	393,331	808,729	586,094	(4)	----------	788,465	260,162
1920	4,013,891	789,499	16,523	2,136,793	4,553,697	----------	739,577	682,132	488,089	1,393,445	674,801	(4)	----------	725,571	(4)
1921	2,534,039	368,131	6,943	1,322,178	3,091,263	----------	284,825	292,439	294,059	777,125	435,866	(4)	----------	739,768	(4)
1922	3,799,865	484,039	8,832	1,982.906	3,995,505	----------	487,167	589,893	407,081	1,142,059	462,044	(4)	----------	790,811	87,631
1923	4,654,075	647,823	12,556	3,187,168	5,042,614	----------	559,711	861,668	554,125	1,648,773	695,824	(4)	----------	897,569	(4)
1924	4,541,058	735,520	8,081	2,355,474	4,272,435	----------	(4)	810,118	397,640	1,770,547	514,764	(4)	----------	869,120	83,070
1925	4,670,481	644,481	4,925	3,011,497	5,141,940	----------	(4)	1,019,209	535,302	1,751,118	518,355	(4)	----------	903,997	(4)
1926	(4)	790,118	3,059	3,336,962	5,990,344	----------	(4)	1,120,610	573,748	1,826,638	619,905	(4)	----------	913,250	(4)
1927	4,364,354	788,586	(4)	3,013,940	5,549,762	----------	(4)	1,077,309	744,091	1,920,394	632,628	(4)	----------	906,321	----------

Year	New York	Ohio	Oklahoma (Indian Territory)	Pennsylvania	Rhode Island	Tennessee	Texas	Utah	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Combined States	Total
1880	----------	100,596	1,546	2,821,384	----------	130,609	----------	1,000	----------	----------	138,755	----------	----------	----------	3,338,300
1881	----------	119,469	1,768	3,437,708	----------	143,853	----------	----------	----------	----------	187,126	----------	----------	----------	4,113,760
1882	----------	103,722	2,025	3,945,034	----------	187,695	----------	250	----------	----------	230,398	----------	----------	----------	4,793,321
1883	----------	87,834	2,573	4,438,464	----------	203,691	----------	----------	25,340	----------	257,519	----------	----------	----------	5,464,721
1884	----------	62.709	1,912	3,822.128	----------	219,723	----------	----------	63,600	400	223,472	----------	----------	----------	4,873.805
1885	----------	39,416	3,584	3,991,805	----------	218,842	----------	----------	49,139	311	260,571	----------	----------	----------	5,106,696
1886	----------	34,932	6,351	5.406,597	----------	368,139	----------	----------	122,352	825	264,158	----------	----------	----------	6,845.369
1887	----------	93,004	10,060	5,832,849	----------	396,979	----------	----------	166.947	14,625	442,031	----------	----------	----------	7,611,705
1888	----------	67,194	7,502	6,545,779	----------	385,693	----------	----------	149,199	----------	531,762	500	----------	----------	8,540,030
1889	----------	75,124	6,639	7,659,055	----------	359,710	----------	761	146,528	3.841	607,880	16,016	----------	----------	10.258,022
1890	----------	74,633	6.639	8,560,245	----------	348,728	----------	8,528	165,847	5.837	833.377	24,976	----------	----------	11,508,021
1891	----------	38,718	9,464	6,954.846	----------	364,318	----------	7,949	167,516	6.000	1,009,051	34.387	2.682	----------	10,352.688
1892	----------	51,818	3,569	8,327,612	----------	354,096	----------	(1)	147,912	7,177	1.034.750	33,800	----------	----------	12,010,829
1893	12,850	22,436	7,135	6,229,051	----------	265,777	----------	(1)	125,092	6,731	1,062,076	14.958	2,916	----------	9,477,580
1894	16,500	32,640	3,051	6,063,777	----------	292,646	----------	(1)	180,091	5,245	1,193,933	4,250	4,352	----------	9,203,632
1895	18,521	29,050	5,175	9,404,215	----------	396,790	286	(1)	244,738	15,129	1,285,206	4,972	4,895	----------	13,333,714
1896	(3)	80,868	21,021	[5] 7,356,502	----------	339,202	----------	(1)	268,081	25,949	1,649.755	5,332	19.542	----------	11,788,773
1897	(3)	95,087	30,364	[5] 8,966,924	----------	368,769	394	(1)	354,067	26.189	1,472.666	17,216	24,007	----------	13,288,984
1898	(3)	85,535	34,110	[5] 10,715,302	----------	394,545	----------	(1)	531,161	30,197	1,925,071	35,280	18,350	----------	16,047,209
1899	(3)	83.878	24,339	[6] 13,577,870	----------	435,308	----------	(1)	618,707	30,372	2,278,577	33,437	15,630	----------	19,668,569
1900	(4)	72,116	38,141	13,357,295	----------	475,432	----------	(1)	685,156	33,387	2,358.499	(4)	(4)	506,730	20.533.348
1901	(4)	108,774	37,374	14.355,917	----------	404,017	----------	(1)	907,130	49,197	2,283.700	(4)	(4)	564,191	21,795,883
1902	(4)	146,099	49,441	16,497,910	----------	560,006	----------	(1)	1,124,572	40,305	2,516,505	(4)	(4)	598,869	25.401,730
1903	(4)	143,913	49,818	15,650,932	----------	546,875	----------	(1)	1,176.439	45,623	2,707,818	(4)	(4)	932,428	25,274,281

1904	(4)	109, 284	44, 808	14. 861, 064	--------	379, 240	--------	(1)	1, 101, 716	45, 432	2, 283, 086	(4)	(4)	1, 451, 172	23, 661, 106
1905	(4)	277, 130	54, 781	20, 573, 736	--------	468, 092	--------	(1)	1, 499, 481	53, 137	3, 400, 593	(4)	(4)	1, 660, 857	32. 231, 129
1906	(4)	293, 994	49, 782	23, 060, 511	--------	483, 428	--------	(1)	1, 577, 659	45, 642	3, 713, 514	(4)	(4)	2, 085, 617	36, 401, 217
1907	385, 478	270, 634	19, 089	26, 513. 214	--------	467, 499	--------	(1)	1, 545. 280	52, 028	4, 112, 896	(4)	----------	1, 088, 493	40, 779, 564
1908	473, 569	159, 578	2, 944	15, 511, 634	--------	214, 528	--------	(1)	1. 162, 051	38, 889	2, 637, 123	(4)	----------	798, 060	26, 033. 518
1909	523, 551	222, 711	(4)	24, 905, 525	--------	261, 808	--------	(1)	1, 347, 478	42. 981	3, 943, 948	(4)	----------	964, 359	39, 315, 065
1910	652. 459	282, 315	(4)	26, 315, 607	--------	322, 756	--------	(1)	1, 493, 655	59. 337	3, 803, 850	(4)	----------	1, 134, 245	41, 708, 810
1911	686, 172	311, 382	------------	21, 923, 935	--------	330, 418	--------	(1)	910, 411	40, 180	2, 291, 049	(4)	----------	1, 947, 258	35, 551, 489
1912	794, 618	388. 669	------------	27, 438, 693	--------	370, 076	--------	(4)	967, 947	49, 260	2, 465, 986	(4)	----------	1, 408, 992	43, 983, 599
1913	758, 486	351, 846	------------	28, 753, 444	--------	364, 578	--------	(4)	1, 303, 603	76, 221	2, 472, 752	(4)	----------	1, 577, 522	46, 299, 530
1914	457, 370	521, 638	------------	20, 258, 393	--------	264, 127	--------	(4)	780, 984	84, 923	1, 427, 962	(4)	----------	1, 593, 651	34, 555, 914
1915	684. 461	684. 658	------------	25, 622, 862	--------	256, 973	--------	(4)	629, 807	136, 552	1, 391, 446	(4)	----------	1, 825, 982	41, 581, 150
1916	775, 014	1, 803, 268	------------	31, 279, 695	--------	382, 175	--------	(7)	1, 242, 332	[7] 534, 653	2, 521, 309	(4)	----------	1, 785, 529	54, 533, 585
1917	993, 184	3, 694, 302	------------	27, 912, 025	--------	411, 326	--------	(7)	1, 304, 230	[7] 497, 533	3, 349, 761	(4)	----------	2, 100, 983	55, 606, 828
1918	1, 069, 587	5, 365, 243	(4)	26, 723, 645	--------	427, 106	--------	(4)	1, 234, 256	123, 788	3, 320, 006	(4)	----------	2, 754. 414	56, 478, 372
1919	751, 067	5, 481, 660	(4)	20, 501, 831	(4)	260, 915	--------	(4)	930, 516	62, 546	1, 413, 932	(4)	----------	1, 474, 347	44, 180, 557
1920	1, 040, 192	5, 701. 810	------------	23, 638, 739	(4)	301, 708	--------	(4)	1, 027, 788	59, 395	1, 828, 336	(4)	----------	1, 533 057	51, 345, 043
1921	746, 916	3, 028, 423	------------	9, 769, 476	(4)	85, 728	--------	(4)	280, 476	27, 260	397, 892	(4)	----------	804, 815	25, 287, 622
1922	1, 494, 992	5, 011, 138	------------	13, 991, 892	(4)	113, 896	--------	172, 453	378, 656	31, 674	919, 744	(4)	----------	771, 734	37, 124, 012
1923	1, 783, 948	6, 473, 606	(4)	25, 624, 286	(4)	304, 511	--------	232, 941	774, 887	69, 068	1, 762, 775	(4)	----------	1, 189, 606	56, 977, 534
1924	1, 600, 669	5, 832, 699	------------	16, 927, 437	(4)	207, 475	--------	257, 094	485, 064	71, 615	1, 328, 569	(4)	----------	1, 201, 156	44, 269, 605
1925	2, 219, 409	7, 261, 187	------------	19, 427, 603	(4)	216, 488	--------	314, 159	421, 691	79, 257	1, 546, 032	(4)	----------	1, 579, 812	51, 266, 943
1926	2, 827, 805	7, 632, 806	------------	21, 922, 976	(4)	241, 034	--------	306, 231	370, 983	67, 286	1, 713, 461	(4)	----------	6, 608, 321	56, 865, 537
1927	3, 602, 642	(4)	------------	16, 777, 291	(4)	227, 120	--------	282, 048	316, 754	71, 271	1, 923, 427	(4)	----------	8, 894, 205	51, 092, 143

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[1] Utah included with Colorado.

[3] Included with Pennsylvania.

[4] Included under "Combined States."

[5] Includes New York.

[6] Includes Massachusetts and New York.

[7] Utah included with Washington.